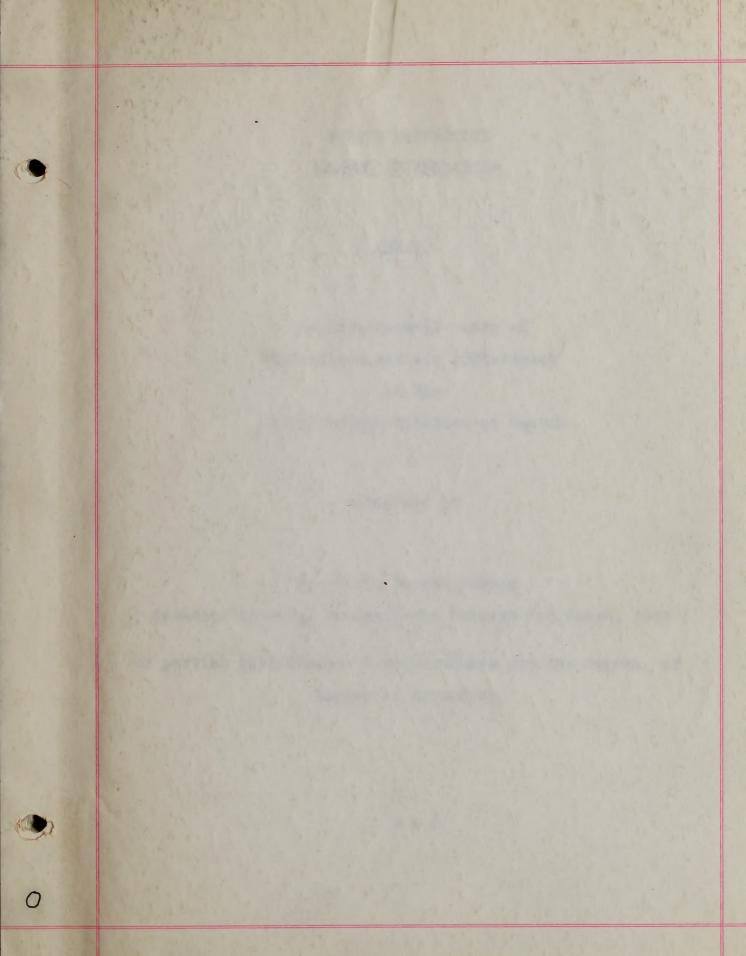
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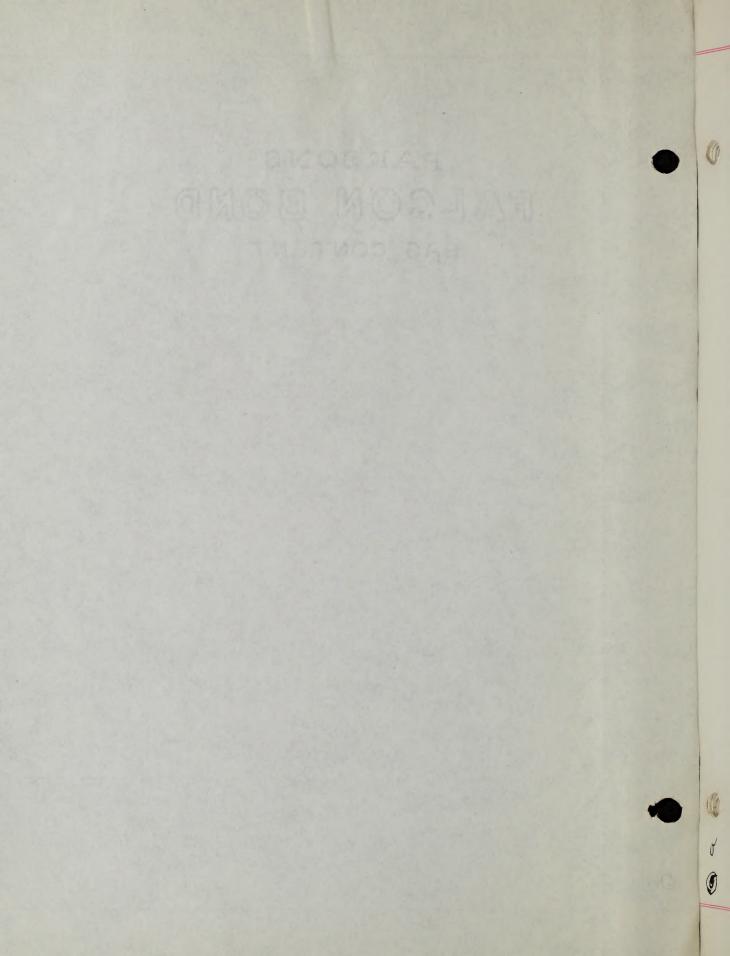
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THESIS

An Experimental Study of
Instruction and Age Differences
in the
Psychological Function of Search

submitted by

Harriette Bowers Ankeny

(Bachelor of Arts, Pennsylvania College for Women, 1923)

in partial fulfillment of requirements for the degree of

Master of Education

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Chapter I Introduction

The Place of Search in the Field of Psychology.

Search; an Intermediate between Perception and Thinking.

The Nature and Definition of Search.

The Search Task or Problem.

Previous Research Studies on Searche

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Search ; an Internediate between Perception and

The Mature and Definition of Search.
The Search Tack or Problem.
Previous Research Studies on Search.

An Experimental Study of Instruction and Age
Differences in the Psychological Function of
Search.

Introduction

The following experimental study is an attempt to investigate age differences and the relative effectiveness of two forms of instruction in search. By search is meant "hunting-to-discover" a designated object in an arrangement of many. This arrangement of many small objects we shall call the "search field." This experiment employs two search fields to be known as Box I and Box II. Search Time is the time required to discover the designated object. In order to secure data on age differences, subjects of two age groups were employed; namely, a group of children in the third grade of school, and a group of adults. To secure comparable data, the same experimental procedures were used for both groups.

Two ways of informing each child or adult what he is to search for were used. The two ways of designating the search object are the two forms of instruction studied. In one, the object that is to be searched for is shown to the subject. This is called the "visual" method of instruction. In the other form of instruction, the subject is told what

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he is to find in the search field. This is called the "verbal" method of instruction.

Each subject is required to find an object designated by name (verbal instruction) in one of the two search fields, and in the other search field, he is required to find an object which is exactly the same as one shown to him by the experimenter (visual instruction). The data are analyzed for differences in the search times as between children and adults, and also for differences related to the two forms of instruction.

The Place of Search in the Field of Psychology

Bentley writes, "Every day living is an art; but it is an art which requires in thoughtful men and women an orderly understanding of the functional and governmental facts which are to be found in the sciences of life."

Different schools of psychology have defined and advanced psychology according to their theories along various specific phases of the science. In general, however, it can be said that modern psychology deals

¹ Bentley, Madison. The New Field of Psychology, p. 351.

he is to find in the search field. This is called the "verbal" method of instruction.

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[.] Bearley, Mediaco. The Her Field of Payendley, T. 251.

with the activities of the individual. As expressed by Eingsley,

"Psychology is conceived as the scientific study of the activities of the individual. It is concerned with all the activities of an individual in which he reacts to and makes adjustments to his physical and social environment."

The word activities encompasses all the performances engaged in by the individual in relationship to his environment. Certainly these performances are many and varied. They include what we do with our arms, legs, and feet when we swim, walk, or run. They include apprehending the on-coming train, observing the newly erected bulletin board, comprehending the newly assigned lesson, rejoicing over the victory of the golf match, or feeling depressed by the saddening news. These activities which make up the field studied by the psychologist include all the diversified performances in which individuals engage as a means of getting on in their environment.

¹ Woodworth, Robert S. Psychology, Fourth Edition.p.3

^{2.} Kingsley, Howard L. "Nature and Conditions of Learning" Manuscript- p.10.

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I woodworth, Hobert S. Isychology, Fourth Edition p. 3

2. Kingeley, Howard L. "Nature and Conditions of Learning"

Memmacript- p. 10.

Some units of activity are simple. Some are complex. Some of the smaller or simpler units are integral parts of larger and more complex units of performance. The term "function" is used to refer to any unit of activity simple or complex which we may select for observation, discussion, or study.

As these activities of the individual in his every day life are the materials to be dealt with by the psychologist it has been necessary to sort and to classify them. The activity of listening to a lecture is, when regarded as a single performance, a psychological function. If we consider playing a game of golf as a unit of behavior it may in its entirety be regarded as a psychological function. Or we can select any part of the performance as a unit for consideration. For example, the act of taking a golf club from the golf bag is a part of the total performance of playing a game of golf. But this, too, is a function of the psychological organism when singled out for consideration.

In this systematizing of human activity, psychologists have found similarities and differences which serve as a basis for classification of the multiplicate functions. First, there are observations which are made directly through the various sense organs. We hear the siren, see the burning building, notice the vivid gold of the

Some willer of the state of respect of particular to term of to beet for and to be state of the state of particulars. The term of tenders and serve complex nuits of particulars to state to serve to the tender of server to serve to tender to the state of several and respect to the state of t

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marble, taste the sweet or sour of some foods, or realize from the sound of the music that a band is passing in the street. This form of activity in which we become aware of the present surroundings or events is called perception.

Also, man can call to mind past happenings, past impressions, past observations. This is remembering, and memory is the term that stands for functions of this type.

Also, we look toward the future, plan, make suppositions and form opinions. This activity is known as imagination. Then there is motor activity such as speaking to a friend, walking across the park, or sawing logs for the fireplace. These activities involving movements are of the executive nature and are called actions. Those activities brought into play by helplessness, awkwardness, and inability to make an appropriate response to the situation encountered and characterized by feelings of fear, anger, or untold joy, are the emotions.

These mentioned functions of perception, memory, imagination, action, and emotions, do not always take place separately, but in many cases blend and combine. They are organic performances and each is dependent more or less upon the antecedent functions. The individual must perceive before he can remember episodes of the past. Perceptions evolve from action. Emotions depend upon perceptions,

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and imagination is governed by the experiences of the past. Then there are off-shooting branches and extensions to be considered. Perception is accompanied and enlarged by inspection. Inspection is characterized by close examination and critical observation with intent to discover more fully. Search, the function with which this study is concerned, extends beyond inspection. As Kingsley describes it:

"Here we have an active quest, an anticipatory exploration which is initiated and sustained by a desire or need to discover a particular object or in some cases a goal."

As the individual searches for an object there is anticipation, and hence a blending of imagination and inspection.

Beyond inspective and perceptive search in the list of psychological functions comes the function of comprehending. It is the process of building up topical meanings. Through it we acquire understanding. In it are combined several of the above mentioned functions.

" Next and finally we have 'elaborative thinking' through which we figure out

Kingsley, Howard L. "Nature and Conditions of Learning".
 Manuscript. p.15.

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^{1.} Hingeley, Howard L. "Mature and Conditions of Learning."
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or create new knowledge, convictions, or solutions to problems by employing in appropriate ways and toward a definite end the functions of perception, memory, imagination, action, inspection, search, and comprehension in what is regarded as the highest and most distinctive feature of the adaptive processes of 1 man."

Search; an Intermediate between Perception and Thinking.

In searching, the organism looks forward into and toward the future, and anticipates; it inspects the search field; its inspection and final discovery of the search object employs perception. In search there is more than preparation for discovery, more than anticipation of the object sought for. In this function the organism actively explores with the purpose of discovery. This seeking out under the impelling influence of a need or desire for discovery is the characteristic of search which distinguishes it from perception.

Search and Thinking are similar in that both are problem-solving. They are prompted and maintained by a

^{1.} Kingsley, Howard L. "Nature and Conditions of Learning".

Manuscript p.16

or eracte new knowledge, convictions, or solutions to problems by exploying in appropriate ways and covard a deficit end the functions of perception, memory, insgination, estion, inspection, energial and comprehension in what is regarded as the highest and most distinctive restant of the adaptive processes of reature of the adaptive processes of mem."

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^{1.} Eingeley, Soward L. "Buture and Conditions of Learning".

situation and they both move toward a goal which satisfies a demand made upon the organism by the situation. They extend beyond perception. However, as search and perception are in some respects like, and still unlike in that search involves more than perception; so we find search and thinking alike to some extent, but uhlike in that thinking goes beyond search by its employment of symbolic materials. Therefore, we find search occupying a place intermediate between perception and problem-solving thinking. "If search does not give us perfect continuity of psychological operation, it does point to a real intermediary that relates perception and thinking in a functional way."

The Nature and Definition of Search.

The writer defines "search" as an activity of purposeful, systematic, exploratory investigation, prompted and
maintained by a lack, need, or demand. It is surprising
that an activity which occupies so important a place in
human living has received so little attention and study
by psychologists. It is mentioned sporadically in the
literature, but few systematic studies have been made of it.

^{1.} Kingsley, Howard L. Search; A Function Intermediate between Perception and Thinking. p.53

Of. Psychological Monographs, No. 2 Volume XXXV.

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^{1.} Tickeley, Howard L. Sodreb; A Punction Internaling between Perception and Thinking. p. 55.

Text books rarely mention it, much less define it systematically. Kingsley who has probably done more experimentation in the field of search than any other psychologist describes search as:

"An active quest, an anticipatory exploration which is initiated and sustained by a desire or need to discover."

Bentley's writings urge attention to this function of search in the following graphic presentation:

"In the functions considered at large, the dynamic aspect of search is fundamental. At the first beginnings of psychological performance in the infant we find this quality of pushing-ahead and reaching-out in the form of primitive search."

Search does not end with infancy. Analyze the school programme of any nation of the world that offers formal education. There is probably no subject nor topic taught which does not involve search in some way. How can the

^{1.} Kingsley, Howard L. "Nature and Conditions of Learning".

Manuscript. p.15 2. Bentley, Madison. The New Field of Psychology.pp.329-330.

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I. Eingeley, Howard L. "Makara and Conditions of Learning".
Hanusoript.

2. Hearing. Westing. The Few Field of Payenelogy.pp. 529-380.

child learn his lessons without searching into the subject matter, or searching for answers in the additions and subtractions, or just looking for his mislaid book? The solving of problems calls for search for clues.

Let it be noted that in the form L of the New Revised 1 Stanford-Binet "Tests of Intelligence" a normal thirteen year old child is expected to be able, as a result of instruction, to plan an hypothetical search so as to retrieve his purse containing much money which has been lost in a very large field.

Not only does formal education involve search, but it encourages search. Is not search a component part of the educative process, an essential to learning? What is research but a systematic search for truth?

So as to cover all the World's peoples and include those who have not undergone formal education, is it not necessary for them to search for many things under the prompting of needs? Primitive man searched for food because his stomach was hungry. He searched for shelter and warmth. Nor do the senile get on without employing the function of search. The aged gentleman who misplaces his eyeglasses either goes through the activity of search or causes another to search for him.

^{1.} Terman, Lewis M. and Merrill, Mand A., Measuring
Intelligence. p.113

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^{1.} Tomsan, Lowis H. and Merrill, Mand A., Messaring

It is not enough to include in our discussion only the human individuals who indulge in active search. Let us note that the jungle animal needs to hunt its prey. The birds migrate and seek for a new home. All through the animal kingdom is found search.

Madison Bentley, who has pioneered the field of search, has identified and placed it in the scheme of psychological functions, traced it through the daily pattern of life, and graphically describes its characteristics and activities. He says:

"All of our psychological operations make their first appearance after birth and all pass through important changes throughout life. A convenient way of relating them, therefore, is through some temporal or developmental plan. We find the primordial function to be a searching and impulsive kind. This is primitive search. It appears soon after birth and is directly followed by perception-action, a mode which involves neither a separate apprehension of objects nor a prophetic and independent action, but both together."

I. Bentley, Madison. The New Field of Psychology. p. 364

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i. Senting, Ashinan. The New Yell of Istobology. p. 364

Of this primitive search which is so interwoven into our lives, Bentley says:

"On the psychological side, appropriately appears the fundamental aptitude of 'search', a mode which is obviously displayed in the human infant soon after birth, and which naturally exemplifies the energetic and directive course of living. When later this 'primitive search' is combined with the digestive sequence of feeding, assimilation, and removal of waste, and still later with perceiving and the simpler forms of action, there concordantly appear the more elementary operations of desiring, longing, anticipating, and attaining. Thereafter and throughout life, the derived and complicated forms of searching play a large part in the psychological economy of the child, the youth, and the adult."

^{1.} Bentley, Madison. The New Field of Psychology. pp.20-21.

of this primitive search which is so interwoven into our

"In the ongoing office and off and "search', a moto which is obvious" after birth, and which naturally excourse of living. When later this filly beardered of 'derest evitining' inclined to consuper avitagil and addinible and recover of waste. the simpler force of action, there tidipating, and attaining, Thereafter Another cont in the payonered a Box .druor air , blide ent lo wwentoo ".dlube est

^{1.} Sentley, Madison. The New Field of Tayonglogy. pp. 20-21.

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Diagram I taken from Bentley shows that author's conception of the primordial nature of "primitive search". It shows primitive search to be the earliest function which appears in the infant. The other functions all emerge from it. The first functions to evolve from primitive search are perception and action. From perception are differentiated a little later the functions of memory and imagination, and emotion is derived from action. Goal searching continues through life to be an important and central form of activity. Inspection is derived from goal searching and perception. Comprehension emerges from combinations of goal searching with perception, memory, imagination, and inspection. Elaborative thinking, the apex of man's mental activity issues from the combined operation of all of the other functions.

The more advanced stages of goal searching demand an alertness and a 'noting more in detail'. This searching activity then includes inspection of the search field. With and because of inspection and search comes understanding. The process of searching for understanding often turns up problems which cannot be solved by perceptual discovery but which must be thought out. This search may itself involve elaborative thinking.

^{1.}Bentley, Madison, "The Psychological's Uses of Neurology", The American Journal of Psychology, Vol. XLIX, (April, 1937), p.236.

Diagram I select from Partner of "primitive meaned".

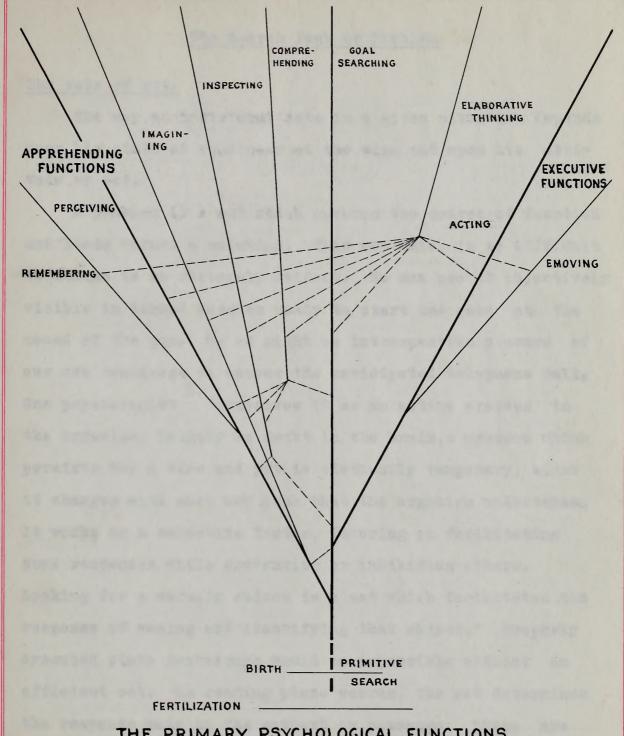
It shows primitive seared to be the earliest inaction which appears in the infant. The other identifies all energy from appears in the infant. The other identifies all energy from it. The first functions to stolve from primitive search at propertion and solden. From primitive search size perception and solden. From primitive search size a little later the functions of memory and imagination, and seation is derived from action. Goal searching of solivity. Inspendion is derived from goal searching and perception. Comprehension entries from combinations of goal searching with perception, memory, inspinations and inspendion. Inspendion, memory, inspination.

The other function from the combined operator of man's mental mother function from the combined operator of man's mental mother functions.

The more advanced stages of your searching demand an alerthess and a 'noting more in detail'. This searching not the desire tield.

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THE PRIMARY PSYCHOLOGICAL FUNCTIONS

DIAGRAM I (From Bentley)

1. Bentley, Madison, "The Psychologist's Uses of Neurology",
The American Journal of Psychology, XLIX, (April, 1937), p. 236.

REMEMBERTING 1. Boutley, Madison, "The Payandlogist's Equa of Engrology".
The Lacrican Journal of Esychology, Maix, (April, 1937), p. 196.

The Search Task or Problem

The role of set.

The way an individual acts in a given situation depends upon his state of readiness at the time and upon his attitude or set.

A problem is a set which governs the course of function and leads toward a solution. This set which is so difficult to define is so obviously evident. We can see it objectively visible in tensed muscles ready to start the race at the sound of the gun. Or we might be introspectively aware of our own readiness to answer the anticipated telephone call. One psychologist "conceives it as an active process in the organism, largely no doubt in the brain, a process which persists for a time and yet is distinctly temporary, since it changes with each new task that the organism undertakes. It works as a selective factor, favoring or facilitating some responses while preventing or inhibiting others. Looking for a certain object is a set which facilitates the response of seeing and identifying that object." Properly executed piano techniques would be impossible without an efficient set. In reading piano scores, the set determines the response made to the context or passages.

^{1.} Woodworth, Robert S. Psychology, Fourth Edition pp. 32-33.

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l. Tondwardh Robert S. Payonalary, Feyrth Millen

certain factors which govern activity. There are the external factors which constitute the stimulus situation to which the individual reacts, and there are the internal factors which are within the individual. One's activity depends both upon factors within the individual and the outside situation confronting him. Or we might say that the environment acts upon the organism . What we perceive is dependent upon what is presented to and transmitted through our sense organs. A pleasant memory is aroused by the sight of a picture of the Hakone Mountain Range. The child's toys and games promote an activity of learning. Any form of the teacher's instruction is an external factor to the child. Explanations help determine the comprehension. It is imperative that these external factors be properly suited for the arousal and direction of appropriate responses to attain the desired development.

While we must be mindful that the external factors have an important influence on one's reactions it is also to be remembered that different persons react differently to the same situation. The individual responds to something external but his response is determined largely by factors within him. In man are found governing sets which determine the nature, and path of activity in a given situation. These sets are

ody era cradi . Wivites activo deidy profest alaccar -amely applicate out application dolds are test Lauredta tion to which the individual reach, and there are the internal factors which ere within the individual. One's fashiving and midily erotost form died annual griving and the owned of tunition confronting his. Or we might taill . Seinagro oult mont even themorives old jeds the transmitted through our some organo. A closent nevert account and to cruteig s to inste out of become at Mountain Range. The child's tops and games prompte an setivity of learning. Any form of the teacher's in--araban is an external factor to the old allow the tions help determine the comprehensian. It is imporeto attein the depicted dayslorment.

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forms of readiness for activity and include determining tendencies for the nature of responses.

Various forms of set.

Hunger and Thirst, caused by a need for food and drink, motivate activity of hunting for food and entering into the process of eating. Yet the most delectable foods are disregarded in the absence of hunger. Hunger causes us to respond to food by eating, because the hungry person is in a state of readiness or is set for reacting in this way to situations which will satisfy his need for food. Likewise many forms of activity are entered into because of other biological sets, such as need for sleep when tired, for exercise when rested, or for escape from pain.

Some sets are acquired. They develop during one's life and become habit tendencies and other functional trends. They may have been built up by repetitions and become a part of one's make up. We skate on the ice with ice skates and we skate on the wooden rink with roller skates—not because of the dictates of these objects, but because of our own acquired predispositions to react to these objects in these ways. What we perceive as we look upon these objects depends on the perceptual trends which have resulted from past functioning. The meanings we attach to the thoughts spoken by another, the memory

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recalled by the sight of some object, the nature of the emotional upset caused by disagreeable circumstances, are all the result of functional trends formed by previous activity. The individual's reaction to a learning situation as presented by another, depends upon habit tendencies and other functional inclinations which have developed all through the individual's life time. All individuals can not react alike to the same instruction because of differences in their previous experiences.

Even a very young child develops social motives.

They are sets which influence his behavior. He wants approval by others, therefore, he tries hard to out-do his contemporaries in order to feel his display of superiority.

Attitude is also a form of set which affects an individual's reactions to instruction. It is a set which an individual brings to a learning situation. Woodworth defines attitude as a set or disposition (readiness, inclination, tendency) to act toward an object. A child's attitude may be dislike for some one or some thing.

Interest is an attitude which is necessary for expert accomplishment.

Attitude and intelligence should not be confused. A bright child can become bored, lose interest, and the teacher may consider him dull. Even in this period of

^{1.} Woodworth, Robert S. Psychology, Fourth Edition. p. 392.

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^{1.} Woodworth, Robert 5. Paychology, Fourth Elition, p. 398.

ing programme with poor spirit and show a low I.Q. Thus it could be his poor attitude which kept him from his best efforts. On the other hand let us consider the child who does something worthy and is given outstanding attention and applause by his teacher and classmates. He secures recognition. He is spirited and his attitude is good. A good attitude is set which results in good outcome.

Besides these relatively permanent sets which have resulted from past functioning there are task and problem. Task is concerned with the action, problem with thinking. They are not independent of the past, yet they must be formulated to provide a form of activity at the time suitable to the requirements of the moment. Their service is comparatively temporary because the task set disappears at exactly the second that the task is completed. The problem no longer exists after it has been worked out or solved.

The task arises from the need for action. It involves an idea of the end that is to be accomplished with active intention to carry out the indicated action. It is an intent to do something which initiates and directs the course of the action.

Dewey describes 'Problem' as a felt difficulty. It

^{1.} Davis, Robert A. Psychology of Learning. p.189 .

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^{1.} Davis, Robert A. Teychology of Learning. p.189 .

is not the precarious situation itself, nor the interrogating words of a teacher -but it is the mental and bodily
state induced by these. It is a set, and this set initiates and governs the search for solution.

Sources of the Task

Let us consider three sources from which task is derived. First there is the demand of the situation or occasion. For example, because extremely hot weather has prematurely set in; the rise in temperature demands that I hunt out of my wardrobe a lighter weight top coat. Upon locating the thinner coat a sense of satisfaction takes the place of the former need.

The second source from which task arises is instruction coming from another. An example is seen in the case
of a child who is told to go to the store by the mother.
We must recognize here that the task is not the request
of the mother, nor the demands of going to the store, but
the child's own governing task set which results from
these. The child's task for going to the store is derived
from the request made by the mother.

The third source from which the task arises is one's self. To illustrate, the history student does an extra assignment not made by the teacher. It is done not because of any outside influence but because of his own impulse, interest, need, or wish. So the task and the problem set

coting words of a teacher -but it is the mental and bodily otate induced by these. It is a set, and this set indicate induced by these of it is a set, and this set indicate induced by the search for columbia.

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may be set up by one's own initiative.

In this present experiment the task is derived from instruction given by the experimenter. The experimenter instructs the subject to find a designated object. instruction serves to arouse in the subject the searchtask which initiates and directs the course of the exploratory activity and sustains it until the goal is reached. There are two types of instruction employed by the experimenter. One is the visual instruction where the subject is shown exactly what he is expected to find. Here the concept of the search object is established by visual perception of that object. The subject looks upon the object he is to find before he starts hunting for it. The other type of instruction is verbal. In this case, the search object is merely named, and it is necessary that the subject establish his concept of what he is to search for from hearing the spoken word. What he looks for then will depend upon the meaning which the word has for him at the moment. This will depend upon associations which he has made with the word prior to the experiment. It appears that the chances for an inappropriate concept or image of the search object would be greater where the subject receives only the name of the object than where he sees it first. In the latter case he should know exactly what to look for. With verbal instruction the

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ucri besites al west and dramitagro dreamer sint of refractions of the encountered by assign and and and and and and ear . tooker between a find a declare of the real content -towers of forjers out in severs of severe mottogrami -olars out in outnos out stourib bus esteitich deine desc tatory activity and suctains it until the gotal is reached. -iragae out to beyoings molvewight to sent out ore erest tooldse oil stork anitoritant lassiv oil at ago . retrem seek .built of beforens at all tede witcome aware of Isoniv ad bunneldates at tested doubse out to typones nerespiten of that to jest. The cubject locks upor the object he is to find before he start hunting for it. The other type of instruction is verbal. In this case, Transpool at it has deman viscent at toothe dozen oft search for from hearing the spoken word. That he looks and brow out deliv galances off word basged filly deat tol for his at the moment. This will depend upon addits which he has made with the word noter to the erroriment. recens this appropriate and secretary and the second of or image of the search object mould be greater where the event medi tacide and to men and wine sevices feeting moni . Stunde of egab mother of all . Devil di soon of ear nother to Look for. With years instruction the

object which the subject has in mind as the goal of his search may differ from the object which he must actually perceive and recognize as his goal. Previous studies on search have indicated that when the subject's concept of the object deviated from the one he was to find discovery and recognition were retarded. Visual instruction was found to give the subject a more precise and accurate picture of his goal-object and this made for more immediate recognition of that object when the searcher's eyes fell on it . Where there was a discrepancy between the concept carried during the search and the perception of the search object the subject sometimes failed to realize that the object perceived was actually the one he was supposed to find. Since such discrepancy is more likely to occur with verbal instruction and since it may be expected to result in longer search times this study has undertaken to compare the relative effectiveness of these two forms of instruction in terms of their search times. Will we get a difference for the two forms of instruction in the time required for finding the designated object? Will there be the same difference for adults as for children? If a difference is found it may be concluded that the one which yields the shorter search times is the better means for preparing the subject for an efficient search and that is so because it provides the subject with a more adequate search-task or set.

ald to Ison out as buts at and tonloss out dates tonles riferres dame ad deader tought out next religib was derest perceave and recognize as hid cost of a sylverion of the object deviated from the one he was to died, discovery and recognifican vers retarded. Vimel instruction was -emul stom not oben with hom tooldo-lace with he stately ever e rederate and the delet to the searcher agent fell on it . Where there was a disorepancy between the search object the embject cometimes falled to realize -que saw ed one off vilastes sew hovicores toolde odd tait of while sind of the and discrepancy is not become earof out should to seementhosite animaler out pragmon of of instruction in torse of their search times. Will we out at neltourisat to smeet out old tot oppoundable a teg fill ? tooido betampiseb out galbait tot borisper amit flore the same difference for scales as for children? one off fait benefonce ad year it bone at some till a TI super reffed ont at pontt florang refred add ablety foldw fails bun former furibility me toll for for out gainegers toll of manch a second a drive too date out subject the common of all

search-task or set.

Previous Research Studies on Search.

'Search' is placed in the pattern of psychological functions by Madison Bentley who shows the arrangement as:

"First, the apprehending group (perceiving, remembering, and imagining); secondly, the executive group (acting and emoving), and beyond these inspecting, comprehending, goal-searching and elaborative thinking."

An experimental study was carried out by Kingsley entitled "Search; A Function Intermediate between Perception and Thinking". This experimentation started on the premise that observations would show the fundamental differences between thinking and perception. The problem was to explore by a suitable method those two types of functional operation for the purpose of discovering their similarities, differences, and to determine whether there could be found intermediate modes of operation serving to fill the gap between them. The set up of the carefully controlled experiment called into action three types of functional operation, i.e., perception, search, and thinking. Results showed that search was a type of perception and

^{1.} Bentley, Madison, "The Psychologist's Uses of Neurology",
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^{1.} Sentist, Madison, "the Psychologist's Uses of Benrylest's

thinking but possessing characteristics of its own. The results of the investigation were as follows:

"1. Search is, like perception and thinking, a function or operation of the total organism. Standing mid-way between these two it serves to connect and to relate them.

- 2. The mental items employed in search are of the same kind, as those used in perception and thinking. There is here, then, no novel or unique mental "element" or mental constellation.
- tion, but it also includes something more. While in simple perception the organism is engaged in apprehending present objects or on-going events, in search it is actively and attentively endeavoring, by way of anticipatory exploration, to discover a specified object or a defined end. In "perceptive search" this discovery is made by way of perception.
 - 4. Search may be included in

thinking our possessing characteries of the own. The recults of the investigation were as follows:

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of search to perception and to thinking is further attested by the fact that thinking may be resolved under repetition into search, and search likewise may be resolved into perception—very much as choice under repetition drops to the impulsive forms and impulse in turn to automatic action."

Another experimental study on search was conducted by Kingsley. This problem set up was to discover the natural relations which the functions of perception, thinking, and that exploratory type of performance called 'search' sustain to each other. The purpose of this study was to get more complete observations upon the process of exploration in order to obtain a more adequate description

^{1.} Kingsley, Howard L. Search; an Intermediate between Perception and Thinking.
Psychological Monographs, XXXV,
No.2, 1926. p.55.

thinking; but here it is only a part of the entire operation. Thinking "elaborates" by the use of its symbol-ical meanings which are derived through search. This form of search is the "elaborative" form.

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l. Kingaley, Howard L. Search; an Intermediate between Ferception and Thinking. Frychological Monographs, KKV. Ho.F. 1926. p. 55.

of this type of function than had been accomplished by the earlier study. The procedure involved the showing of pictures where-by the subjects entered into a search performance to discover and identify the named object in the picture. Observations made by the subjects on their visual explorations were fully recorded. These reports revealed as features of the search performances: exploratory eye-movements, rapid shifts of attention, verbal kinaesthesis, and muscle strains of head, eyes and neck. The termination of search came with discovery of the object and was accompanied by satisfaction and relaxation.

A later study by Kingsley was published under the title
"The Influence of Instruction and Context upon Perceptive
Search." This experiment compared the two forms of instruction, visual and verbal, which are employed in the present
investigation. It was found in that study that frequently
the object-meaning derived by the subject from verbal instruction, where the search object was simply named, did not
coincide with the perceived object. This delayed and hindered
discovery and termination of the search. This experiment
was arranged so that under "visual instruction", the subject
was instructed as to what he was to hunt for by being shown
an exact duplicate of the search object.

^{1.} Kingsley, Howard L. "The Influence of Instruction and Context upon Perceptive Search". The American Journal of Psychology, Vol. XLVI (July, 1934), pp.437-442.

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^{1.} Hingeley, Jorespiive Search". The Lourism Journal on to Jayout apon Journal of Lourism Journal of Payobology, 702. Mivil July, 19241, gr. 197-412.

The results revealed that search and apprehension follow the same general course whether the object to be found was designated verbally or presented visually. The visual method of showing the search-object gave more explicit knowledge in preparation for discovery under visual instruction. The search task was easier to carry out, the exploration was more deliberate, recognition of the search-object was more certain, and the time required for discovery was shorter than was the case of verbal instruction.

Another experiment by the same investigator dealt with the influence of context on search. Its purpose was to study search where no clues could be obtained from the arrangement of the search field. Two types of search field were employed. One consisted of a single large picture, in which some obscure object was designated as the object to be found by the subject. This was designed to provide relevant context for the search object. Irrelevant context was secured in the other type of search field by making the field of a large collection of smaller pictures of unrelated objects, one of which was signated as the search object. It was found that search an object surrounded by unrelated things (irrelevant context) was more difficult to carry out successfully than it was where the context was relevant with the object of the search being naturally related to its surroundings. It was also found that during the course of search there was seldom clear perception

^{1.} Kingsley, Howard L. "The Influence of Instruction and Context upon Perceptive Search", The American Journal of Psychology, Volume XLVI, (July, 1934), p. 440.

The country revealed that search and appreciate follow the country country and the country country the object to be found was designated verbally. The viewal asthed as about to the search-object have note explicit knowledge in preparation for discovery ander viewal instruction. The meaned tack was easier to carry out, the exploration was more deliberate, recognition of the search-object was more certain, and the time required for discovery was shorter than was the case of the required for discovery was shorter than was the case of the required for discovery was shorter than was the case of the required for discovery was shorter than was the case of the required for discovery was shorter than was the case of the required for discovery was shorter than was the case of the required for discovery was shorter than was the case of the required for discovery was shorter than was the case of the required for discovery was shorter than was the case of the required for discovery was shorter than was the case of the case

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^{1.} Elegator, Howard L. "The Indianos of Lastraction and Context upon Porceptive Search". The American Journal of Estanology Volume Civi. (1912, 1974), p. esp.

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A further experiment was done with numbers. It was previously demonstrated that when the subject already knows exactly the appearance of the sought object because its duplicate has been seen, then recognition in search is immediate. Thus, if the visual object is so familiar as to leave absolutely no doubt, then it seems that oral designation would be as adequate as visual designation. This supposition was tested by printed numbers. The one to be found was designated orally. The result was that immediate recognition appeared. Where a perfectly correct idea of the search object was obtained from verbal instruction there appeared no advantage in favor of visual instruction.

"A Time Element" experiment used both the visual and the auditory methods of designating the search-object. A record was made of the time required for successfully completing the search task. The results indicated that under the visual method of instruction the time required to discover the search object was somewhat shorter than under verbal instruction.

^{1.} Kingsley, Howard L. "The Influence of Instruction and Context upon Perceptive Search", The American Journal of Psychology, Volume XLVI (July, 1934), pp. 440-441.

^{2.} Kingsley, Howard L. "The Influence of Instruction and Context upon Perceptive Search", The American Journal of Psychology, Volume XLVI (July, 1934), pp.441-442.

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Chapter II

Statement of the Problem

Significance of the Problem

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Statement of the Problem

The purpose of this experimental study is to investigate the influence of the mode of instruction and age on the psychological function of search. The problem involves the following factors for consideration:

- 1. Do differences exist in search time under two different modes of instruction for children? The two modes of instruction used are "visual "and "verbal". In the visual instruction the subjects are shown a duplicate of an object which they are to find in the search field. In verbal instruction the object to be found by searching is simply named by the experimenter. The search time is the time which lapses between the actual beginning of the search and its termination by the discovery of the object of search.
- 2. Do differences exist in search time under these two different modes of instruction for adults ?
- 3. Will a greater difference in search time be found for children or adults between the visual and verbal modes of instruction?
- 4. Does the visual or the verbal mode of instruction show the greater variability in search times, and is there a difference in variability of search times as between children and adults?

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4. Does the visual or the verual mode of instruction show the greater variability in search times, and is there a difference in variability of search times as between children and adults?

- 5. Is there a difference between children and adults with respect to ability to form and maintain an adequate set for search and discovery?
- 6. Are there differences between children and adults with respect to the manner in which the searching process is carried out?

Significance of the Problem.

While some meritorious experimental studies have been made on search, the research on this subject has been of limited quantity and has been devoted to adults only. Search is a field worthy of and ready for further experimentation. The significance of this study is two-fold. In the first place, it is the first experimental investigation of search in children. It aims to contribute some discoveries regarding the characteristic features of the searching form of activity as it appears in children. In the second place, no previous study has operated to make comparisons between children and adults in this field. This study makes such a comparison.

It should be noted here that a previous experimental 1 study has compared the visual and verbal instruction as sources of set for search, but that experiment used only

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The American Journal of Psychology,

XLVI (July, 1934), pp. 437-442.

- o. Is where a difference between children and adults and naturals an and calabata an adequate set for search and discovery?
- 6. Are there differences between children and adults with respect to the manner in which the search-ing process is carried out?

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adult subjects. The present study experiments with visual and verbal modes of instruction with adults also, but this is the first study to include children in a comparison of these two modes of instruction. The data on adults in this study have been gathered for the purpose of discovering age differences. No previous research attempted a comparison of the searching activity of children and adults.

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Chapter III

Experimental Procedure

Subjects

Experimental Materials

Series Order

III vergedo

Experimental Procedure

Entrantal Materials

Experimental Procedure

Subjects

The people who served as subjects for this experiment included two groups. The first group known as the 'child group 'included one hundred third grade children of the Belmont Public Schools of Massachusetts. The second group known as the 'adult group 'included one hundred mature people, namely; some business men and women, university students, a few professors, and other persons of various vocations.

Experimental Materials

Two Search Fields were used: these are referred to as "Box I " and "Box II ". These Boxes (Box I and Box II) were of uniform size (14 inches by 22 inches), same shape, and white in color. The Box covers had decorative designs of brightly colored geometrical non-descript figures. They played no part in the experiment but were designed to lend interest.

The interiors of the boxes (which served as the two search fields) contained eighty-five small miscellaneous objects in random yet neat arrangement. Each object was safely secured, in its respective position. These objects of various shapes, sizes, colors, and kinds-used in the search-task were such as could be readily recognized by -32-

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any children of the third grade level as well as by all adults. A small safety pin in Box I and an average looking button in Box II were the objects to be found in their respective search fields.

Procedure

The writer served as examiner throughout the experiment. By means of a stop-watch a careful record was made of the seconds required by each subject to discover the designated object in each search field. Each subject stood in front of the Boxes so as to have a comfortable and accessible view of the contents immediately the lid was removed. Each performed his search-task individually. Experimental procedures were the same for each except for the variations in procedures for the groups described below.

The Four Series

In order to balance practice effects between the two forms of instruction, provision was made for having one-half of the subjects operate under visual instruction first and under verbal instruction second; while the other half operated under verbal instruction first, with visual instruction coming second in order. Also in order to balance for the two forms of instruction any possible inequalities of difficulty for the two tasks

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Proposite

The writer served as erasiner throughout the orner inent. By means of a stop-match a careful resort was made of the escones required by each subject of the designated object in each search field. Each subject the designated object in each search field. Each subject stop of the Borer as as to have a somicritable sud authoritate immediately the lid and search that find procedures were the same for each except for the variations in procedures for the groups described below.

The Four Series

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(search in Box I and search in Box II) it was arranged to have visual instruction used with Box I by half of the subjects while the other half used Box II with visual instruction. Likewise the use of verbal instruction was equally divided between the two Boxes. These variations in procedure were secured by dividing the one hundred children into four groups of twenty-five each, designated as A, B, C, and D with a separate experimental series for each which correspondingly are indicated as Series 1, 2, 3, and 4.

Thus for the children we have :

Series 1 , Group A , 25 children .

Series 2, Group B, 25 children.

Series 3, Group C, 25 children.

Series 4 , Group D , 25 children .

A corresponding grouping was made for the one hundred adult subjects, with a similar set of four series.

The procedure with respect to order of presentation of the visual and the verbal modes of instruction and the Boxes used with them for the four groups of children and the four groups of adults were then as follows:

1. Group A, Series 1, first were given the Visual instruction with Box I and then the Verbal instruction with Box II.

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Series 4 , Orong 2 , Ms children .

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The procedure with respect to order of presentation
of the visual and the versal modes of instruction and
the Boxes used with them for the four groups of childthe Boxes used with them for the four groups of childthe Boxes used with them for the four groups of childthe Boxes used that them for the four groups of childthe four groups of adults were then an follows

A dress instruction with Box I and then the

- 2. Group B, Series 2, first were given the
 Verbal instruction with Box II and then the
 Visual instruction with Box I.
- 3. Group C , Series 3 , first had Verbal instruction with Box I and then Visual instruction with Box II .
- 4. Group D , Series 4 , first had Visual instruction with Box II and then Verbal instruction with Box I .

These procedures are summarized in Table A .

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- 3. Group C , Saries S , Sirst had Varies instance to motion the William I and them With Box II .
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These procedures are summarized in Table A .

Table A

Order of Procedure for the Four Series conducted for Both Children and Adults

			Group A	Series 1		
(1) (2) (1) (2)	Box Box	11	Visual Verbal Group B Verbal Visual	Instruction Instruction Series 2 Instruction Instruction		Subjects
	Box					
	Box					
(1)	Box	I	Verbal	Instruction	0.5	Only do not
(2)	Box	II	Visual	Instruction	25	Subjects
			Group D	Series 4		
(1)	Box	II	Visual	Instruction	95	Cub tocto
(1)			Verbal	Instruction	25	Subjects

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	Both Children	

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	instruction.		II xod	
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	anitointeal	Invest?	II 205	
as Subjucts	neltoniuml	Indrov		

The first series of twenty-five subjects entered into the Search-Task to discover the designated object in the following manner:

Subject

Visual
Box I Instruction

Verbal

Instruction

Box II

Examiner

Examiner says: "I have here a Box (designating covered Box I). Inside of it are many small things. One of them is just like this (show a small safety pin). When I take the cover off the Box, you are to find as quickly as possible the one like this. When you find it, point to it and say 'There'. Do you understand? Ready- Now." Examiner removes the cover from the Box. Examiner records the search time required to find the designated object.

Examiner again says: "I have here another Box (designating covered Box II). Inside of it are many small things.

I will name what you are to find. When I name it you are to

out become exception of twenty-time and extend that out in the designated of leab-decast end out to the designated of leab-decast end in the designation of the decast of

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Imaminer mays: "I have here a Box (derigosting covered to I I . Inside of it are many amplifiation. One of them is just like thin / show a small safety pin). Then I take the cover off the Box, yin are to find at unlocky as possible the one like this. Then you find it, yount to it and out 'There'. Do you understand I Ready- Now." Examiner removes the cover from the Box. Samminer records the cover from the Box. Samminer records the cover from the Box. Samminer records

Examiner again sage: " I have here another for (derignaving devered for II). Inside of it are many sate L things. I will name what you are to find. Then I name it you are to find it as quickly as possible. When you see it, point to it and say 'There'. Ready? "Simultaneously the examiner removes the cover from Box II and says, "Find the Button." The examiner records the search time required to find the designated object.

The Individual Record Sheet is completed by the Examiner.

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find it as quietly as possible. When you see it, point to it and say "Thorn". Ready ? " Simultaneously the analts removes the dover from Box II and says. "Find the Button." The exeminer removes the search time required to find the designated object.

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The second series of twenty-five subjects entered into the Search-Task to discover the designated object in the following manner:

Subject

Verbal Visual

Box II Instruction Instruction

Box I

Examiner

Examiner says: "I have here a Box (designating covered Box II). Inside of it are many small things. I will name what you are to find. When I name it you are to find it as quickly as possible. When you see it, point to it and say, 'There'. Ready? "Simultaneously, the examiner removes the cover from Box II and says..." Find the Button." The examiner records the search time required to find the designated object.

Examiner again says: "I have here another Box (designating covered Box I). Inside of it are many

Annual established with the discount the dealgrants of the collect the first following manner:

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BOX II

Institution

I WOR

Eraminer

Examiner eags: " I have here a how (designating covered Box II). Incide of it are many easil things. I will name what you are to find. When I name it you are it find it as quickly on possible. When you are it, the point to it and sey, There '. Heady ? " Simultaneously, the examiner remarks the says." The cover from Box II and says. " Find the Button." The examiner remarks the septent.

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small things. One of them is just like this. (Show a small safety pin). When I take the cover off the Box, you are to find it as quickly as possible. When you see it point to it and say 'There'. Do you understand? Ready...Now." Examiner them removes the cover of Box I and records the time required by the subject to find the designated object.

The Individual Record Sheet is completed by the examiner.

email things. One of them is just like this. (They a small seately pin!. Huge I take West caver off the Sox. you are to find it as quietly de possible. Then you see it o it sud to it sud tay! There!. He you under-atend t seat!. Now. Transfer that removes the cover of Box I and records the time required by the subject to link the designated onizes.

the individual Noverd Sheet is completed by the

examinare.

The third series of twenty-five subjects entered upon the Search-Task to discover the designated object in the following manner:

Subject

Verbal Visual Instruction Box I Instruction Box II

Examiner

Examiner says: " I have here a Box (designating covered Box I). Inside of it are many small things. I will name what you are to find. When I name it you are to find it as quickly as possible. When you see it, point to it and say ' There '. Ready ? " Simultaneously, the examiner removes the cover from Box I and says " Find the safety pin." Examiner records the search time required to find the designated object.

The Individual Record Sheet is completed by the examiner.

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Examiner again says: "I have here another Box (designating covered Box II). Inside of it are many small things. One of them is just like this (show a button). When I take the cover off the Box, you are to find as quickly as possible the one like this. When you find it, point to it and say 'There'. Do you understand? Ready...Now ". Examiner removes the cover from the Box, records the search time required to find the designated object and completes the Individual Record Sheets

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Interfeet egain ways: "I have here another how a dasignating covered hor II). Inside of it are many small things. One of them is just like this (show a button). When I take the cover off the Box, you are to find as quickly as possible the one like this. When you find it, point to it and say ' There'. Do you andertind it, point to it and say ' There'. Do you anderthe sor, records the search time required to find the designated object and completes the Individual Hecord Sheet.

The fourth series of twenty-five subjects entered into the Search-Task to discover the designated object in the following manner:

Subject

Visual Verbal

Box II Instruction Box I

Examiner

Examiner says: "I have here a Box (designating covered Box II). Inside of it are many small things. One of them is just like this. (Show the button). When I take the cover off the Box, you are to find as quickly as possible the one like this. When you find it, point to it and say 'There'. Do you understand? Ready...Now ". Examiner removes the cover from the Box and records the search time required to find the designated object.

Examiner again says : " I have here another Box

The fourth deries of twenty-fire subjects entered to the fourth of the Search-Tage to disnover the designated object in the fallowing mentor:

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Experient days: "I have here a sor (designating covered adw II). Incide of it are many small things. One of them is just like thin. (Show the button). Then I take the cover off the Aox, you are to find as quickly as possible the one like this. When you inderstand it, point to it and may ' There'. No you inderstand? Ready... Now ". Examiner recovers the cover from the Box and resords the search of a required to find the designated object.

Examinar again eags : " I have more another Box

(designating covered Box I). Inside of it are many small things. I will name what you are to find. When I name it you are to find it as quickly as possible. When you see it point to it and say 'There'. Ready?" Simultaneously, the examiner removes the cover from Box I and says "Find the safety pin ".

The examiner records the search time required to find the designated object and completes the Individual Record Sheet.

10. Sine to complete Sparch-Task (record in seconds

1E. Observations such as obtitude, method of autosh of problem, approach, facial expressions, bolil

lie Hotations of ability to mintain the task,

verbal and testual kinnowheats, and remarks (particularly regarding the consept of the

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(designating covered Box I). Inside of it are many amal things. I will mame what you are to find. When I name it you are to find it so quickly as possible. When you see it point to it and say 'There'. Ready?" Simultaneously, the examiner removes the cover from Box I and says "Find the existy pin ".

The examiner records the search time required to find the designated object and completes the Individual Record Sheet.

Individual Records

An Individual Record was kept for each child and adult to include the following data:

- 1. Group and series number.
- 2. Date of the experiment.
- 3. Name.
- 4. Age.
- 5. Date of Birth.
- 6. Sex.
- 7. School grade.
- 8. Intelligence Quotient.
- 9. Mental Age.
- 10. Time to complete Search-Task (record in seconds).
- 11. Eye patterns.
- 12. Observations such as attitude, method of attack of problem, approach, facial expressions, bodily movements, posture.
- 13. Notations of ability to maintain the task.
- 14. Recordings of promptings and urgings (if any), verbal and tactual kinaesthesis, and remarks (particularly regarding the concept of the search object).

A copy of the record sheet is presented on page 100.

The entire procedure as here stated for the children's groups was used in identical order and detail for the adult groups.

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An Individual Record was kept for each obild and shult to include the following data:

- 1. Group and series number.
- S. Date of the experiment.
 - S. Hame.
 - A. Ago.
 - 5. Date of Birth.
 - .xeg .3
 - V. School grade.
 - 8. Intelligence Quotient.
 - 9. Montal Age.
- 10. Time to complete Search-Task (record in seconds).
 - 11. Hye patterns.
 - 12. Observations such as attitude, method of attack of problem, approach, facial expressions, bodily movements, posture.
 - . Mestions of shility to meintain the task.
 - 14. Recordings of promptings and urgings (if any).

 Verbal and tactual kinasethesis, and remarks

 (particularly regarding the concept of the
 search object).

A copy of the record sheet is presented on page 100.

The entire procedure as here stated for the children's groups was used in identical order and detail for the adult groups.

Chapter IV

Results

- (1) Data and Discussion
- (2) Observations on the Search Performance

Chapter IV

Regulte

(2) Observations on the Search Performance

Experimental conditions being the same for Children and Adults, like data were collected for all subjects.

Table I ,page 47, shows the visual and verbal search time scores for Children, Group A , Series 1. The range of the visual scores is from 2 to 25 seconds. The verbal scores show a much larger range from 0.5 to 145 seconds. The mean of the visual scores is 10.38 with a standard deviation of 6.1. The mean of the verbal scores is 20.28 with a standard deviation of 30.4.

The reason for the great difference in means and standard deviations between the two methods (visual and verbal) is due to a few extremely high scores in the verbal distribution; for example, the case of 45 seconds, one case at 80 seconds, and the most extreme case of 145 seconds.

By the generally accepted technique for showing the differences between the two methods, the critical ratio was established. The critical ratio as established by the differences of the means is 1.44. It is not entirely statistically significant, but (by interpolation) shows that there are 93 chances in 100 that it is a true difference. The visual method is the more favored method.

Experimental conditions being the name for dillarent and identity, like data were collected for all sales and search and identity of the fine scores of the visual accres to the visual accres to from A. Serios 1. The reage of the visual scores to from A. Serios 1. The result of the visual scores to from O.5 to 155 seconds. The mean of the visual scores is 10.38 with a standard deviation of the verbal scores is 10.38 with a standard deviation of the verbal scores is

The reason for the great difference in means and standard deviations between the two methods (visual and verbal) is due to a few extremely high scores in the verbal distribution; for example, the case of 45 seconds, one case at 80 reconds, and the dost extreme case of 145 seconds.

By the generally accepted technique for showing the differences between the two methods, the existes ratio was established. The eritical ratio as established by the differences of the means is 1.64. It is not entirely significant, but (by interpolation) shows that there are 35 chances in 100 that it is a true difference. The viewel method is the more favored method.

Table I Shows Time Scores in Seconds for Children Group A Series 1.

Subjects	Visual Instruction Box I	Box II	
The state of the s	1	2	
2 3	7.5	80	
3 4	5	28	
5	12.5 18	3 7	
6	6.5	45	
7	7	7	
9	10	13	
10	9	5	
11	11	14	
12	22	145	
13	2	20	
14 15	11 7	3 9	
16	4	4	
17	25	17	
18	ĩi	16	
19	7	3	
20	9	21	
21	6	7	
22	25	12	
23 24	7	0.5	
25	11	3	
N	25	25	
Range	225	0.5145	
Mean	10.38	20.28	
S.D.dis	6.1	30.4	
S.E.m	1.22	6.8	
Diff.of means	9.9		
S.E.D -	6.18		
S.E.D.M. Ratio	1.	1.44	
First Quartile Median	1]	20	
Third Quartile	7	16	
Q Quartife	2	8	
S.E.mdn	ĩ.53	4 8 8,5	
Diff. of medians	3		
S.E.D.mdn	8.63		
Critical Ratio	•35		

Bertus A ... Series T.

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However, because of extreme skewness of the verbal scores, there is here applied another technique of showing differences between two methods.

Because similar conditions of skewness are found in the verbal distributions of future series these additional techniques for showing differences have been used.

The critical ratio as established by the differences between medians is .35 and it is considerably lower than the critical ratio of 1.44, established by the means; therefore, a further method of showing the reliability of the difference is attempted by the standard error of the difference between correlated medians. The critical ratio here results in .34, and is not materially affected by correlating the visual and the verbal scores.

Figure 1 shows the distribution of visual and verbal time scores for Children, Group A, Series 1. The range for the visual scores is 2---25 seconds and 0.5---145 seconds for the verbal scores.

^{1.} Peters, Charles C. and Van Voorhis, Walter R. Statistical Procedures and Their Mathematical Bases. pp.160-190.

^{2.} Garrett, Henry E. Statistics in Psychology and Education. p.218.

However, besense of extreme elevanous of the verbel acores, there is here applied another rechnique of show-ing differences between ter asthese.

Headuse statistions of fiture cortes and there additionthe versal distributions of fiture cortes there additional techniques for showing differences have been used.

The oritical ratio as established by the differences between medians is . So and it is considerably lower than the critical ratio of 1.64, established by the means; therefore, a further method of showing the reliability of the difference is attempted by the standard error of the difference between correlated medians. The oritical ratio here results in .84, and is not materially rifected by the verbel scores.

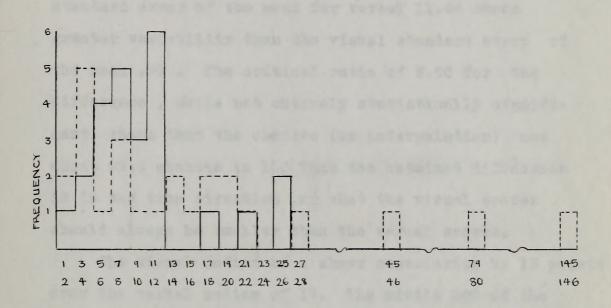
Pignre I shows the distribution of visual and verbal time scores for Children, Group A. Series 1. The range for the visual scores is 2---25 seconds and C.5---165 seconds for the verbal scores.

^{1.} Peters, Charles C. and Van Voorhie, Welter R. Statistical Procedures and Thole Mathematical Bases.

^{2.} Garrott, Henry H. Statistion in Perchology and Studention. p.218.

Figure 1

Distribution of Visual and Verbal Time Scores
for
Children Group A Series 1



Time Scores in Seconds

-----VISUAL FREQUENCY BOXI

----- VERBAL FREQUENCY BOXI

03.

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Figure 1

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Time Secrets in Seconds

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Table II, page 51, shows the visual and the verbal time scores in seconds for Children, Group B , Series 2. The range for visual scores from 0.5 to 25 shows very much less range than the verbal score range of 1.5 to 300 seconds. The one case of 300 seconds for the verbal is a spurious case; however, still there are other cases for the verbal, requiring 50 seconds, 60 seconds, and even two cases require some 80 seconds which tend to cause a very much higher range than the 25 seconds which is the highest score for the visual. The visual mean shows superiority by 30.20 points over the verbal mean. standard error of the mean for verbal 11.66 shows greater variability than the visual standard error of the mean .99 . The critical ratio of 2.60 for the difference, while not entirely statistically significant, shows that the chances (by interpolation) are about 99.6 chances in 100 that the obtained difference is in the true direction ,or that the visual scores should always be smaller than the verbal scores.

The visual median of 4 shows superiority by 13 points over the verbal median of 17. The middle 50% of the verbal scores ranged from 8 to 45 seconds and from 3 to 8 seconds for the visual. This series like the former series show the difference in means and medians to favor the visual scores.

factor off bee facer one works . Id ower . II offer time secres in seconds for Children, Group 3 , Series ?. the range for viewal acover from 0.5 to 25 to shows very or d. I to spage eroos ladrov out made spage seel down Sod seconds. The one care of 300 seconds for the verbul seaso redio era eredi llite revewed ; sess emolings e si for the verbel, requiring 50 seconds, 50 seconds, and even two cases require some 90 seconds which tend to asue a out at delile absocs 33 out made eguar redaid down vier highest score for the visual. The visual mean shows superiority by 30.20 points over the veroal mean. The standard error of the mean for verbas 11.56 where to rorre braduats fammir odt medt gillideiter totebre the mean .00 . The critical mario of 2.60 for the -illingia vileoississis vioritae ton elide , constallin cant, shows that the chances (by interpolation) are short 99.6 shances in 100 that the obtained difference seroos Lausiv ent tent to, moitouris out ent at al .seroes fedrev out ment reffers ed eyewis bloods

The viscal median of 4 shows superiority by 12 points over the verbal median of 17. The middle 50% of the everbal secret from 5 to 45 seconds and from 5 to 6 seconds for the visual. This series like the former series show the difference in nozas and medians to favor the visual secree.

Table II Shows Time Scores in Seconds for

Children Group B Series 2.

Subjects	Verbal Instruction Box II	Visual Instruction Box I
1	17	13
2		10
3	10	1.5
4	33	5
5	65	3
6		1.5
7	45	5.5
8	80	WI BUSELLE 8 1 1 TO
9	6	2
	85	
11	4	5.5
12		9 3
13	50	19
14 15	10	3
16	3.0	•
17	7	4
		25
19	33	6
20		3
21	9.5	3
22	17	S. D.S. Com tle vemus
23	5	2
24	3	0.5
25	300	4
N	25	25
Range	1.5300	0.525
Mean	35.72 58.31	5.52
S.D.dis S.E.m	11.66	4.97
D. D. M	11,00	.99
Diff. of means	30.20	
S.E	11.27	
Critical Ratio	2.60	
First Quartile	45	8
Median	17 Mind the	4 3
Third Quartile	8	3
Q change for the	19	3
S.E. mdn	14.58	1.24
Diff. of medians	13.	
	14.0	63
S.E.D.mdn		
Critical Ratio	• 6	83

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Table II Shows Time Stores in Seconds for

Serios 2.

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0.0		
	0.0 88 88	₽
2.5	38	8
8.0	22	5
2.2		
8		
		8
0.8		
5.6		
2	50	12
7	1.0 2.0 2.0 2.0	24 25 26 27
		7: 5
8. 0 2 2 8		
		91
9 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8		
	1.5	08
	9.6	
	9.5	3.3
	Ğ	83
0.0	E	23
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	N. CV	oise, or wears
	11.5	S.E
	8.8	netest 12015 but
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		The bearing the bearing
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8 8 2 2.84	14.53	S.E. man
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	3.65	. M. 8
		ACOM . U
	B.	CITEM LECTION

Figure 2 shows the distribution of visual and verbal time scores in seconds for Children, Group B, Series 2. The visual scores range from 0.5 to 25 seconds and the verbal scores range from 1.5 to 300 seconds.

Table III, page 54, shows the visual and verbal time scores in seconds for Children, Group C, Series 3. The range of the visual scores is 0.5 to 13 seconds with a mean of 3.39. The range of the verbal scores is 2 to 240 seconds. The lowest verbal score of 2.0 seconds is four times the lowest visual score of 0.5 seconds. highest verbal score of 240 seconds is approximately seventeen times the highest visual score. The verbal mean of 22.82 is 19.43 points larger than the visual mean of 3.39. Also the standard deviation 46.06 for the verbal is much greater than the standard deviation of 2.95 for the visual. which shows greater variability for the verbal. critical ratio of 2.11, while not statistically significant, shows the difference in favor of the visual and (by interpolation) the chances are 98 in 100 that this is a true difference.

Because of the spurious case of 240 seconds for the verbal, by another measure we find that the middle 50% of the cases for verbal lie between 6 and 23 seconds. The data show the visual scores to be less variable. The middle 50% of the visual scores lie between 1.5 and 4

Figure 2 shows the distribution of visual and verbal time scores in seconds for Obildren, Group B, Saries 2. The visual scores range from 0.5 to 25 seconds and the verbal coores range from 1.5 to 200 seconds.

Table III, page 54 , shows the visual and verbal time scores in seconds for Children, Croup C , Series S. the range of the visual scores is o. S to 13 seconds with of 2 al seroes isoter end to sense edt . 65.6 to naom a si abnoces O.S lo erose fedrev Jeswol and . abnoces 048 four times the lowest visual moore of 0.5 seconds. The highest verbal score of 240 seconds is approximately mean fedray add .eroom family tendent desireves .es. to usem facely out mant regral string 24.81 at 58.32 To Also the standard deviation 46.06 for the verbal is much greater than the standard deviction of 2.35 for the visual; which shows greater veriability for the verbal. -thing in vilacitates ton alidw . IL 2 to other lacitivo cant , shows the difference in favor of the visual and (by interpolation) the chances are 98 in 100 that this is a true difference.

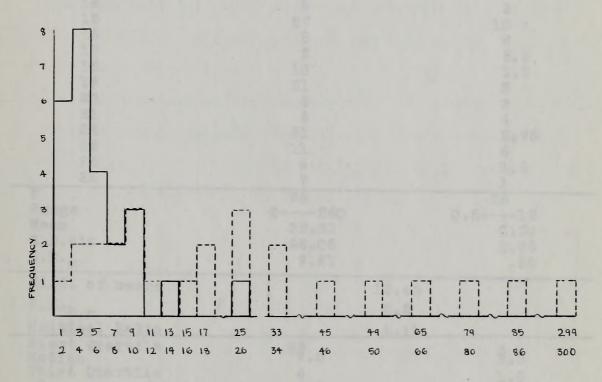
Boosume of the spurious case of 240 seconds for the vorbal, by another messure we find that the middle 50% of the eases for verbal lie between 6 and 88 seconds. The data show the visual scores to be less variable. The middle 50% of the visual scores lie between 1.5 and 4

Figure 2

Distribution of Visual and Verbal Time Scores

for

Children Group B Series2



Time Scores in Seconds

----- VISUAL FREQUENCY BOXI

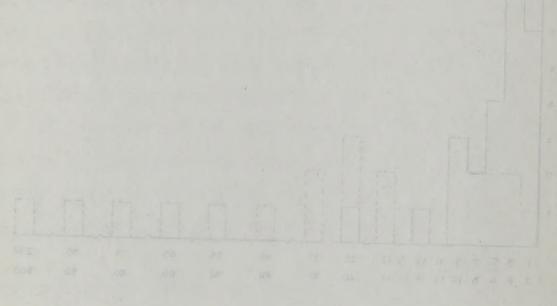
---- VERBAL FREQUENCY BOYIL

· Figure 2.

Distribution of Visual and Versal Time Scores

George Series

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Time Stones in Seconds

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Table III Shows Time Scores in Seconds for

Children	Group C	Series 3.
Subjects	Verbal Instruction Box I	Visual Instruction Box II
1	6	13
2	240	as the alternation
3	17	4
4		2
5	9.5	2
6	8.5	2
7 8	10	3 3
8	20 11.5	0.5
10		1
11	60	1.5
12		4
13	23	1.5
14	9	3
15	27	10
16	5 - 4 - 4 - 4 - 4	
17	2	3.5
18	10	1.5
19	31 6	3 2
21	6	4
22	31	2.75
23	11	6
24	6	1.5
25	7	1
N	25	25
Range	2240	0.513
Mean	22.82	3.39 2.95
S.D.dis	46.06 9.21	•59
S.E.m	3.21	• 0 5
Diff. of means	19.43	
S.E.D.m	9.2	
Oritical Potto	2.11	
Critical Ratio First Quartile		
Median	23.5	2.5
Third Quartile	6 8•5	1.5
Q		1.25
S.E.mdn	11.51	.64
Diff.of medians	7.	
S.E.D.mdn	11.53	
Critical Ratio	•61	
OTTOTAL MOUNT	• • •	

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Seaton S.	D quash	Children .
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II Ros.	I wos	etoetdat
81		
I	240	2
	17	8
		4
8 8 8 0.0	3.6	a
	8.8	3
8		
8	03	8
8.0	31.6	
		11
1.5		II
	A STATE OF THE STA	3.5
1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5	2 03 A 83 83	18 10 11 11 11 11 11 11 11
3		M
10	73	15
	5	35
3.5		TI
8.7	10	8.2
-	175	19
3		
2	9 9	75
27.5	37	88
9		83
1.5		5.0
	7	25
83	65	- manufacture and a second
0.51.5	2240	
88.8	2240 22-82	
89.8	80.85	alb.a.a
8.8 8.9 83.	9.21	.1.2
	39.95	Diff. of means
	3.0	47 19
and the second of the second o	11.0	
	29.5 6.5 8.5	Wise poercile
4.8	6.5	Third Quartie
1.25		ATTA 1220 DATES
02.4	72 66	
£0.	20 e de 1	chin. E. C
	11.58	smerhow to 1110
	11.55	otdel landing
	fa.	widows Frankstown

seconds. This series like series 1 and series 2 show the difference to be in favor of the visual form of instruction.

Using this series for another sampling to see if the critical ratio obtained by correlating the two methods (visual and verbal) is materially affected, the following is solved by the formula: "standard error of the difference between correlated medians." [2-1.31 and difference mdn = 12.34. The difference of the medians is 7 and the critical ratio of .57 is not materially different from the critical ratio of .61 as obtained from uncorrelated medians. The chances are about 73 in 100 that this is a true difference.

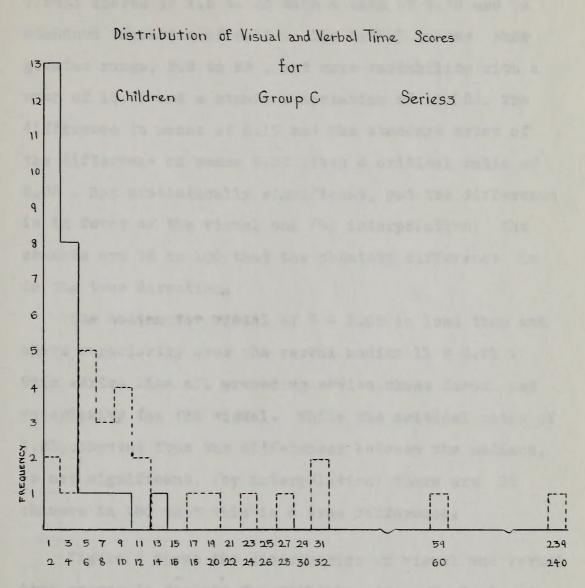
Figure 3 shows the distribution of visual and verbal time scores in seconds for Children, Group C, Series 3. The range for the visual scores is 0.5 to 13 seconds, and 2 to 240 seconds for the verbal scores. accords. This series like series I and ported 2 show the difference to be in favor of the visual form of instruction.

Heing hald series for another sampling to see if the

abouter out ent guitaleries of besiated offer lacitics guivelet at setesting the testing the following (visual and verbal) is materially affected, the following is solved by the formula: "standard error of the difference out between correlated mediane." [2 -1.3] and [61:17-18] and the mediane is 7 and the critical ratio of .57 is not medianally different from the critical ratio of .51 as obtained from theorem. It is the difference are about 73 in 100 that this lated mediane. The chances are about 73 in 100 that this is a true difference.

Figure 2 shows the distribution of visual and verbal time scores in seconds for Children. Group C.Series 5. The range for the visual scores is C.5 to 15 seconds, and 2 to 240 seconds for the verbal scores.

Figure 3



Time Scores in Seconds

- VISUAL FREQUENCY BOXI

--- VERBAL FREQUENCY BOX I

Table IV shows visual and verbal search time in seconds for Children, Group D, Series 4. The range of visual scores is 1.5 to 35 with a mean of 9.98 and a standard deviation of 8.10. The verbal scores show greater range, 3.5 to 93, and more variability with a mean of 18.08 and a standard deviation of 18.05. The difference in means of 8.10 and the standard error of the difference of means 3.96 gives a critical ratio of 2.05. Not statistically significant, yet the difference is in favor of the visual and (by interpolation) the chances are 98 in 100 that the obtained difference is in the true direction.

The median for visual of 5 ± 2.03 is less than and shows superiority over the verbal median 11 ± 4.51.

This series like all preceding series shows favor and superiority for the visual. While the critical ratio of 1.21, computed from the differences between the medians, is not significant, (by interpolation) there are 88 chances in 100 that this is a true difference.

Figure 4 shows the distribution of visual and verbal time scores in seconds for Children, Group D, Series 4.

The range of the visual scores is 1.5 to 35 seconds and for the verbal time scores 3.5 to 93 seconds.

reduce for Children, Group D. Sories & The range of viewed for Children, Group D. Sories & The range of viewed accres is 1.6 to 35 with a mean of 9.99 and a standard deviation of 8.16. The vertel secret chow standard deviation of 8.16. The verteliantly with a grouter range, 3.5 to 95, and more vertelially with a mean of 18.06 and a standard deviation of 18.06. The difference in means of 9.10 and the standard error of the difference of means 5.90 gives a critical ratio of 2.05. Not standard with vigalities of the visual and (by interpolation) the chances are 98 in 100 that the obtained difference is the the obtained difference is

The median for visual of 2 = 2.02 is less then and shows superiority over the verbal median 11 = 4.51.

This series like all proceding series super favor and superiority for the visual. While the critical ratio of 1.21, companed from the differences between the medians, is not significant, (by interpolation) there are 58 chances in 100 that this is a true difference.

Figure 4 shows the distribution of visual and verbal time scores in seconds for Unildren, Group D. Beries 4.
The range of the visual scores is 1.5 to 25 seconds and for the verbal time scores 5.5 to PA seconds.

0

Table IV Shows Time Scores in Seconds for

Children Group D Series 4.

CHILTRE	Group D	201102 4.
Subjects		Verbal Instruction
Subjects	Box II	10
1	2 7 7	8
7	13	
0	10 4	11 8
5		5.5
6	1.5	7
7	11	
2 3 4 5 6 7 8	21	11
9	35 4	9
10	2.5	14
11		
	2.5	20
12	22	17
13	27	6
14	3.5	22
15	11	30
16	23	25
17	3	25
18	1.5 5 4	3.5
19	5	6
20	4	30
21	11	17
22	4	93
23	2	7
24	15	6
25 N	<u>8</u> 25	42 25
N		
Range	1.535	3.593
Mean	9.98	18.08
S.D.dis	8.10	18.05
S.E.m	1.62	3.61
Diff. of means		10
S.E.D.m.		96
Critical Ratio	2.	.05
First Quartile	15	25
Median	5	11
Third Quartile	3 6	7
Q		9
S.E.man	2.03	4.51
Diff. of medians	6.	
S.E.D.mdn Critical Ratio	4.	95
T. D. MUII		21

Table IV Diewe Time Secret in Sevende for

Series 4.	Group D	nezhlido
Voices Institution	TO SECTION TO THE P	A CONTRACTOR OF THE PARTY OF TH
Box I	II NOE	Sabjecte
0.1		
	8.5	
11	10	8
ā.ā	3.6	0
	4	
7		
11		
1.9		
16	5.3	
03	8,9	TI
		18
8	72	18
	2 - 30	14
		2.5
08	11	3.5
25	2.5	
2.5		
5.5	1.6	
6		57.0
08	Δ.	81
17		
	3	
	9	50
3.583	1.536	
18.08	0.00	TON.
16,05	8,10	eib.d.
3.61	33.1	4.2.8
		and the second s
	8.10	Diff. of means
	5.30	oltes feetil
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Figure 4

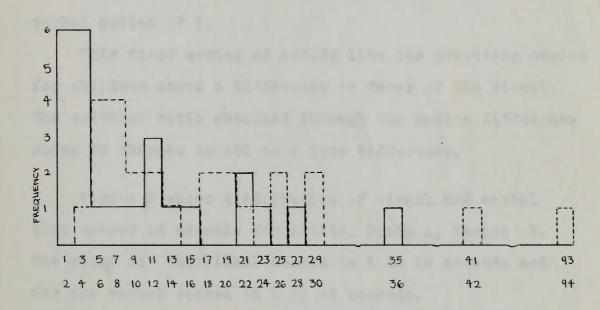
Distribution of Visual and Verbal Time Scores.

for

Children

GroupD

Series 4



Time Scores in Seconds

----VISUAL FREQUENCY BOXT

----- VERBAL FREQUENCY BOXI

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Time Score in Seconds

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Table V shows visual and verbal time scores in seconds for Adults, Group A, Series 1. The visual scores range from 1 to 15 seconds with a mean of 4.62, and the verbal scores range from 1 to 48 seconds with a mean of 10.96. The visual scores show less variability with a standard deviation of 3.82 than the verbal scores with a standard deviation of 12.24. The difference in means shows a superiority of 6.34 points in favor of the visual. The critical ratio of 2.44 approaches significance in favor of the visual with 99.2 chances in 100 that this is a true difference.

The visual median of 4 is superior by 2 points to the verbal median of 6.

This first series of adults like the preceding series for children shows a difference in favor of the visual. The critical ratio obtained through the median difference shows 73 chances in 100 as a true difference.

Figure 5 shows distribution of visual and verbal time scores in seconds for Adults, Group A, Series 1. The range for the visual scores is 1 to 15 seconds and for the verbal scores is 1 to 48 seconds.

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This first series of shift state the proceding series for children shows a difference in fever of the visual.

The critical ratio obtained through the median lifference shows 75 chances in 100 as a two difference.

Figure 5 shows distribution of visual and verbe t. Series t. The coores in a second and The roace for the visual scores is 2 to 15 seconds and for the verbal scores is 2 to 48 seconds.

Table V Shows Time Scores in Seconds for

Adults

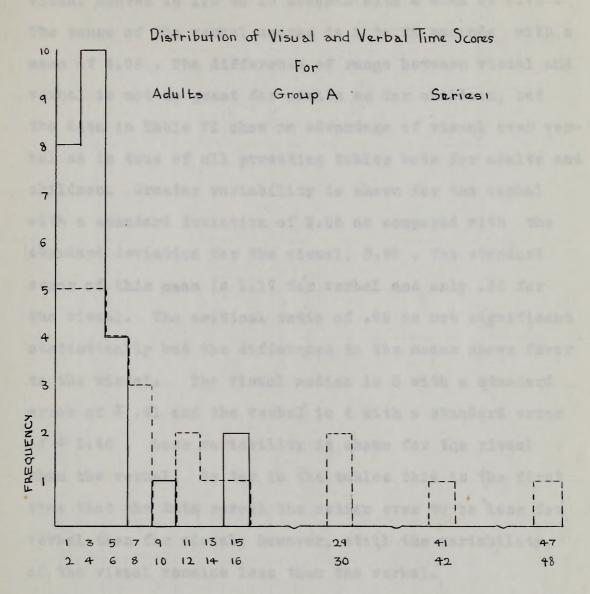
Group A Series 1.

Subjects	Visual Instruction Box I	Verbal Instruction Box II
1	4	6
3	5	41
4	2	29
2 3 4 5 6 7	5 5 2 15	5
6	1 .	7
7	4	2
8	9	15 3
10	1 4 4 2 2 4 3 3	12
11	$\tilde{4}$	$-\tilde{7}$
12	3	29
13	3	14
14		1
15 16	10 2.5	3.5
17	4.5	2.5
18	2.5	3.5
19	3.5	6.5
20	5	6
21	4.5	
22 23	15	48
24	6 2.5	2.5 8
25	1.5	2.5
N	25	25
Range	115	148
Mean S.D.dis	4.62 3.82	10.96 12.24
S.E.m	.76	2.45
Diff. of Means	6.	
S.E.D.m	2.	6
Critical Ratio	2.	
First Quartile	5	14
Median Third Quartile	2.5	6 3.5
6 tutta anatotta	1.25	5
S.E.mdn	.95	3.06
Diff. of medians		1.0045
S.E.D.mdn Critical Ratio	3.	
OTT LIGHT VALUE	•	63

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8.8	0.00 0.00 0.00 0.00	
8.8	0.8 0.8 0.8	
	- 7	
	4.6	50
0.1		
	0.4	
8.6		
	2	
10.95	88.	
18.84	38.3	628.0.8
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	1.35	
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	. S	order and Attendance

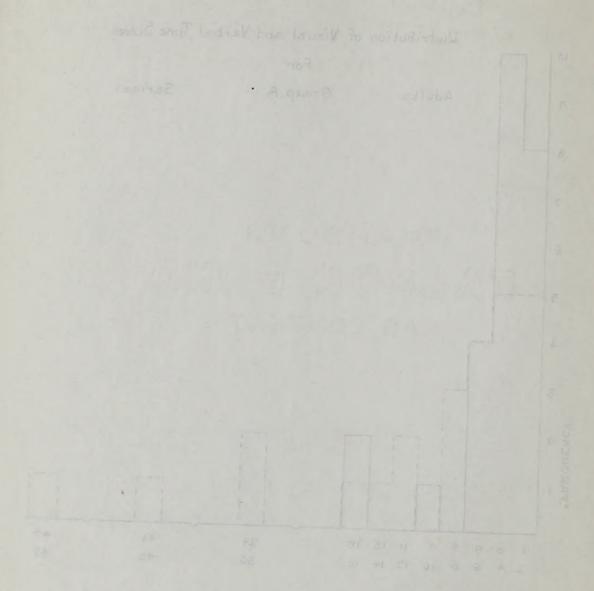
Figure 5



Time Scores in Seconds

VISUAL FREQUENCY BOX I

--- VERBAL FREQUENCY BOX I



Time Scores in Seconds

LADS YOUR PARQUENCY BOX 1

TO TOB YOUR FREEDRENCE BONT

Table VI shows the visual and verbal time scores seconds for Adults. Group B. Series 2. The range of the visual scores is 1.5 to 15 seconds with a mean of 5.76 . The range of the verbal scores is 1 to 22 seconds with a mean of 6.96. The difference of range between visual and verbal is not so great for adults as for children, but the data in Table VI show an advantage of visual over verbal as is true of all preceding tables both for adults and children. Greater variability is shown for the verbal with a standard deviation of 5.85 as compared with standard deviation for the visual, 3.25. The standard error of this mean is 1.17 for verbal and only .65 for the visual. The critical ratio of .99 is not significant statistically but the difference in the means shows favor to the visual. The visual median is 5 with a standard error of \$.81 and the verbal is 4 with a standard error of \$ 1.46. Less variability is shown for the visual than the verbal. So far in the tables this is the first time that the data reveal the median ever to be less for verbal than for visual; however, still the variability of the visual remains less than the verbal.

In this series as in Series 1. for Children, and Series 3. for Children, will be shown a relationship of the methods (visual and verbal) as determined by the formula: "the standard error of the difference between

dosonds for Alults, Trung B. Sorios t. The range of the visual scores is 1.5 to 15 seconds with a mena of 0.76. and to oppose at of I st porous factor off to oppose off mend of 8.96 . The difference of ridge bettern visual and ted , respired tot on attack tot tenen on for at Ledger, but -TOV 1870 ISBNIV TO SERVING OR SOME IV SIDER AT STAR AND bus attobs tot stod solder saltepone lie to earl at as lad Indian of not hande at whilldalvay referred . deadline oft after autograp as as a to nothered bredaste a fire avendered deviction for the viming, 2.25 . The utablere TOT 38. WING how letter to TI. I at about cler to north the visual. The driving fatte of .88 is not significant Total sunds susse out al socstellis add and vilusicalitate. trebucte a stiw o or called fereiv out. . Isselv est of TOTTS DESCRIPT S'ASIN & 61 INCREV SAS AND 18. I TO TOTTS Lauriv agy Tol mone of prilitainey ason . 60.1 \$ 10 then the verbel. So far in the apples this is the first Tot used on or move mailed and inever stal only stall only Williaminer and Illie , wavewed thought not next ladies . Laurer edt medt meel mulmert famter ent to

the methods (visual and verbal) as debarated by the formula: "The methods (visual and verbal) as debarated by the formula: "The attendent order of the difference between

Table VI Shows Time Scores in Seconds for

Adults	LAST -	Group B	Series 2	
Subjects	Verbal	Instruction Box II		struction x I
1		2		
2		11		.5
3		16	4	1
4		17		
5		3		
6		4		
7		3.5	•	
8		15		
10		2	13	T-
11		2	12	
12		22	the resources	
13		3		
14		1 1 Ttoolly	utgatteant	7
15		12		7
16		11 on the		
17		2.5		1.5
18		1		
19 20		12		3
21		7		
22		5		3
23		4	18	5
24		4	3	3
25	Legan	10		5
N	_	25	28	
Range	1	22	1.5	
Mean S.D.dis		6.96 5.85		5.76 3.25
S.E.m		1.17	•	.65
m m		7.71		•00
Diff. of means			1.20	
S.E. Critical Ratio			1.31	
Critical Ratio			.99	
First Quartile		12	,	7
Median		4		5
Third Quartile		3		í
0		5		.5
S.E.mdn		4 3 5 1.46		.81
Diff. of medians	1		1.0	
S.E.D.mdn Critical Ratio			1.65	
Critican Potto			.61	

Table VI Shows Time Scores in Seconds for

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	Instruction Vis	TROZEA
I XOE	IL KOS	Subjects
3 4	S II	1
4.5	II	
	19	8
	44	
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	11	
		10
	8 8 8 8	77
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	SI	15
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	1	87
	2.9	07
		5 A
		USI
		SS
		88
5		22 23 42
G		
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01d.f	88 80.8 80.8	Range
07.0	8.96	
5.85	8,85	A 1 8 7 0
. 38.	1.17	SID.U.C
1.5 3 3.5 3.5 5.76 5.25 5.25 8.85		S.D. 618
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	I.C. I.	9.70
	66.	nesetas patto
	4	10000120
7 8 4 6.1	31	elitrang deriv
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ā.1	2.48	Third Quartile
18.	200	
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	0.2	busiles to .thic
	38.I	
	.63.	S.M. D. man. g.M. S.
		CERNE FRANKLUT

correlated medians." By the rank difference Method

$$\int_{-.18}^{-.18} \cdot \int_{-.18}^{-.18} \int_{-.18}^{$$

Median difference = 1.0

The correlation does not materially affect the critical ratio .59 as compared to the critical ratio of .61 as computed from the differences between the uncorrelated medians. The difference is not statistically significant but the data reveal the difference to favor the visual scores.

Figure 6 shows the distribution of visual and verbal time scores in seconds for Adults, Group B, Series 2. The range of the visual scores is 1.5 to 15 seconds and 1 to 22 seconds for the verbal scores. coursisted medians." By the rank difference Method

Tuite, was = V(1.46)2 & (.61)2 - 8 (-.18) (1.46) (1.61)

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O.f - operorolita cutbed

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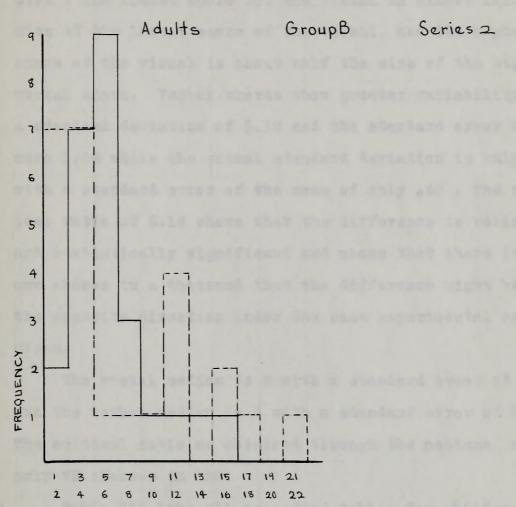
The correlation dess not materially effect the eritical ratio of .61 as compared to the eritical ratio of .61 as compared to the engineer the uncorrelated medians.

The difference is not statistically significant but the data reveal the difference to layer the visual scores.

Figure 6 shows the distribution of visual and verbal time scores in seconds for Adulta, Group B. Series 2. The range of the visual scores is 1.5 to 15 seconds and 1 to 28 seconds for the verbal scores.

Figure 6

Distribution of Visual and Verbal Time Scores for



Time Scores in Seconds

----VISUAL FREQUENCY BOXI

Figure

Distribution of Visual and Verbal Time Scores

Time Scores in Seconds

Type yoursubtrate Jackety

Table VII shows the visual and verbal time scores in seconds for Adults, Group C. Series 3. The visual scores range from 1.5 to 11 seconds with a mean of 3.4, and the verbal scores range from 2.5 to 23 seconds with a mean of 6.92 . The lowest score for the visual is almost half the size of the lowest score of the verbal, and the highest score of the visual is about half the size of the highest verbal score. Verbal scores show greater variability with a standard deviation of 5.18 and the standard error of the mean 1.04 while the visual standard deviation is only 1.99 with a standard error of the mean of only .40. The critical ratio of 3.18 shows that the difference is reliable and statistically significant and means that there is only one chance in a thousand that the difference might be in the opposite direction under the same experimental conditions.

The visual median is 3 with a standard error of \$\pm\$.50 and the verbal median is 4 with a standard error of \$\pm\$1.30 . The critical ratio as obtained through the medians shows only 73 chances in 100.

Table VII like all preceding tables for children and adults shows favor toward the visual.

Figure 7 shows the distribution of visual and verbal time scores in seconds for Adults, Group C, Series 3. The range of the visual scores is 1.5 to 11 and the range of the verbal scores is 2.5 to 23.

Mi seroof said Ledyov Sie Camely and twois TTV-sided seconds for Aldive, from 0, Series 3. The virual socres out but . A.C to mean a data shoons If of d.f gort care to meet a drive abrooms AS of a.d most become corons fadent odd Tied decerte at lamely odd rot crope decert odf . Se. 8 sine of the lowest soors of the verbal, and the hickory verbal aporo. Verbal woors show croater variability with off to yours Stokests out one Si. C to molinives Arebusts t 98. I wise at acttained bremmar family and elider bo. I many -tire off . Oh, who to neer off to rear a brokerte a dr w efdetler at ascernillth out tedt aword 81.7 to older fast wisc of stady dead among two twentitionis wilcontaiteds bus at ad trigite operatitit end that beamends a st serence one -three introducing eras off usban matterile of second off ·Scord.

The vicus business a dith a standard error of 2.50 ont the vertex and the address of the average that the contains and through the contains above only 75 chances in 100.

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Figure 7 shows the Aletribution of risual and verbel wise secree is second for Adalta, Group C. Series G. Tae range of the risual secree is 1.5 to 11 and the range of the verbel scores is 2.5 to 25.

Table VII Shows Time Scores in Seconds for

Adults Group C Series 3.

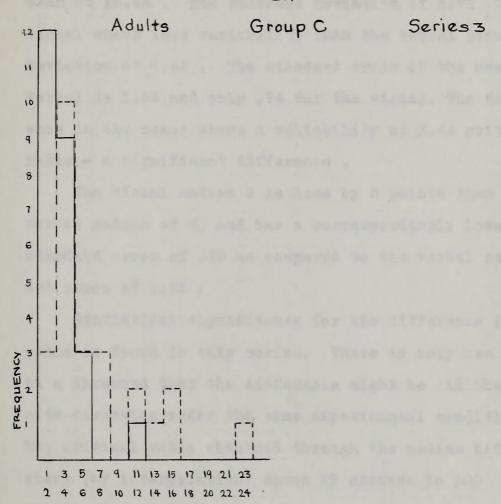
Subjects	Verbal Instruction Box I	Visual Instruction Box II
1	7.5	1.5
2	4	2 3 3•5
3	4	3
4	22.5	3.5
2 3 4 5 6 7 8	3	2
6	3.5	2.5
7	5.5	5
8	6.5	3.5
9	16.5	2.5
10	4	2 3.5
11	7	3.5
12	2.5	3 6 4
13	3	6
14	7.5	
15	11	1.5
16	12	11
17	3 4	2.5
18		4
19	2.5	2.5
20	4	2.5
21	3.5	2.5
22	5	6 2 3•5
23	15	2
24	23	3.5
25	13	3
N D	25	25
Range	2.523	1.511
Mean	6.92	3.4
S.D.dis	5.18	1.99
S.E.m	1.04	•40
Diff.of means	3	.52
S.E.D.m	1	.11
Critical Ratio		.18
First Quartile	111	4 3 2•5
Median	4 3. 5	3
Third Quartile	3.5	2.5
Q	4	.75
S.E. mdn	1.30	•50
Diff. of medians		•0
S.E.D.mdn		
	THE YESTELL PRESIDENT	.39
Critical Ratio		•72

Teble VII shows Item Boores in Reconst for

Toblogatulit lawall	Estimation (some)	Subjects
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8.6	a.g. c.c a.a. a.a.	200
8		
6.0	3.3	
ā	G e G	
6.5	0.0	
8.8	6.01	
		10 11 18 18
3.5	7	
0.0	8.5	SI
G.	12.	13
8 6		14.
	3.2 8.8 8.7 7.5	14
0.1		3 7
	1.8	16 17 18 19 20 21 20 21 20 21
8.8		5 T
4	· 1s	
	8.6	QI.
0.49	W. • 13	-03
8.9	8.6 2.5 3.5	
4	3.3	0.0
		20
		8.3
3.8	88	48
3.5	18	58
	836.3	Range
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		m. C. B.
	1.1	ottaR faction
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		ledian
		a residence of the help
2.5	2.5	
67.		
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A the same of the		nuelbon to . 171
	0.1	The state of the s
	88.5	.E.D. son

Figure 7

Distribution of Visual and Verbal Time Scores



Time Scores in Seconds

-----VISUAL FREQUENCY BOXI

---VERBAL FREQUENCY BOXI

Table VIII shows the visual and verbal time scores in seconds for Adults, Group D, Series 4. The visual scores range from 2 to 15 seconds with a mean of 4.6. The verbal scores range from 2 to 35 seconds with a mean of 10.44. The standard deviation of 3.71 for visual shows less variability than the verbal standard deviation of 7.63. The standard error of the mean for verbal is 1.53 and only .74 for the visual. The difference in the means shows a reliability of 3.44 critical ratio,— a significant difference.

The visual median 3 is less by 5 points than the verbal median of 8, and has a correspondingly lower standard error of .93 as compared to the verbal standard error of 1.91.

Statistical significance for the difference in the means is found in this series. There is only one chance in a thousand that the difference might be in the opposite direction under the same experimental conditions. The critical ratio obtained through the median differences (by interpolation) shows 99 chances in 100 that this is a true difference.

Figure 8 shows the distribution of visual and verbal time scores for Adults, Group D, Series 4. The range for the visual scores is 2 to 15 and the range for the verbal scores is 2 to 35.

Table VIII shows the visual and verbal time secret in seconds for Adelts, Group B. Series 4. The visual accres range from 2 to 15 seconds with a mean of 6.6. The verbal secres range from 2 to 25 seconds with a mean of 10.44. The standard deviation of 5.71 for visual shows less variability than the verbal etandard deviation of 7.62. The standard error of the mean for verbal is 1.65 and only .74 for the visual. The difference in the means shows a reliability of 5.46 critical ratio. - a significant difference.

The visual median 3 is less by 5 points then the verbel median of 3, and has a correspondingly lower atendard error of . 20 as compared to the verbal standard error of 1.21.

Etatiatical aignificance for the difference in the means is found in this sories. There is only one chance means is the that the difference might be in the opports at the theorem the same experimental conditions. The critical ratio obtained through the median difference ones (by interpolation) shows 95 chances in 100 that this is a true difference.

Piggre 8 shows the distribution of visual and verbel time scores for Adults, Group D. Series 4. The
range for the visual scores is 2 to 15 and the range
for the verbal scores is 2 to 25.

(1)

Table VIII Shows Time Scores in Seconds for

Adults	Group D	Series 4.
Contract :	Visual Instruction	Verbal Instruction
Subjects	Box II	Box I
1	4	6
2 3 4 5 6 7 8	15	13 35
3	12	6
4	0	4.5
2	A	9
7	7	4
8	6 3 4 3 3.5	13
9	6	12
10	2	4
11	4	2
12	2	2 4
13	3	5
14	3	5 5
15	2	10
16	2	6
17	2	20
18	6 2 4 2 3 3 3 2 2 2 2 2 5 2 3 5 5 5 5 5 5 5 5	16
19	2	25
20	3	17
21	3.5	15
22	5 _	8
23	2.5	12.5
24	5	4
25	15	5
N Doman	25 215	25
Range	4.6	235
Mean S.D.dis	3.71	7.63
o b D.D. ata	.74	1.53
S.E.m	•14	1.00
Diff.of means		84
S.E.D.m		70
Critical Ratio	3.	44
First Quartile	5 3 2.5	16
Median	3	8
Third Quartile	2.5	Đ
Q	1.25	9
S.E. mdn	•93	15 8 5 5 1,91
Diff. of medians	5.	0
S.E.D.mdn		12
Critical Ratio		31

Table VIII Shows Time Scores in Seconde for

Adults	a arous	Berie	
	Mortsunfeel Lawell II xos		
Subjecte	FT X08	-	100
· ·	är		35 35 8
	3.5		
20	13		68
			•
			•
8 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	8		4
	3.8		
	3		
T.T.	A		
Y: T			
8.5			
27			
GI	62 65		
16			0.0
			2.6
1.8	8		20 25 27 17
			0.8
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re	3.8		
20			
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58	15		88
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	61S		88
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phs of p	3.71		7.63
816.0.8	3.71		10.44 7.65 2.65
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Diff. of means	8	48.	
		07.	
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			13
elitreto desta	2		
maiball			
Third Quartile	0.8		
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S.B.p. adm		84.	
		18.	

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Figure 8

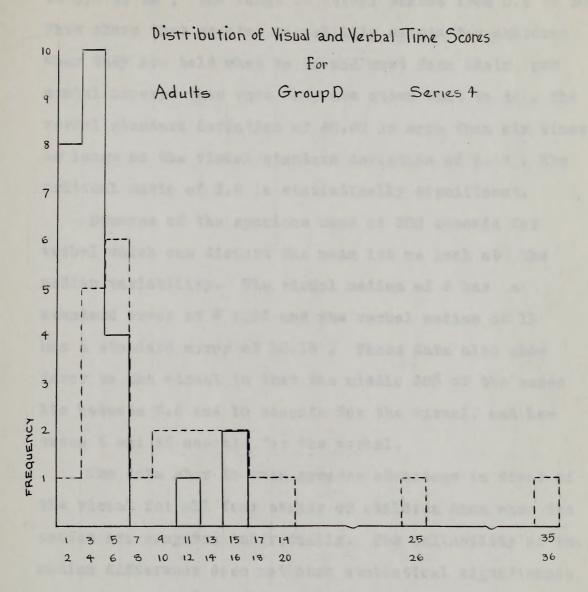


Figure 10

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Time Secrets in Seconds

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Table IX shows a comparison of all visual scores and all verbal scores for Children. The range of visual scores is 0.5 to 35; the range of verbal scores from 0.5 to 300. This shows that greater variability exists for children when they are told what to do and must form their own mental concept than when they are shown what to do. The verbal standard deviation of 40.60 is more than six times as large as the visual standard deviation of 6.17. The critical ratio of 3.9 is statistically significant.

Because of the spurious case of 300 seconds for verbal which can distort the mean let us look at the median variability. The visual median of 4 has a standard error of ± 1.55 and the verbal median of 11 has a standard error of 10.15. These data also show favor to the visual in that the middle 50% of the cases lie between 2.5 and 10 seconds for the visual, and between 6 and 25 seconds for the verbal.

The data show to even greater advantage in favor of the visual for all four series of children than when the series are computed individually. The reliability of the median difference does not show statistical significance but the data reveal that there are about 75 chances in 100 that it is a true difference.

Figure 9 shows distribution of visual and verbal time scores in seconds for children for all four series. The range for the visual is 0.5 to 35 seconds and for the verbal is 0.5 to 300 seconds.

Tella II shows a comparison of all visual accres and all visual cores for the visual cores. The range of visual cores for 0.5 to 200. is 0.5 to 25 to

(1)

Boosnes of the secretary of the mean lat us look at the verbel which can distort the mean lat us look at the verbel which can distort the rimes median of A has a standard error of 1.55 and the verbel median of the case has a standard error of 10.15. These date also show the polymen f. 5 and in that the middle 50% of the cases tween 5 and 10 seconds for the verbel, and he is the verbel.

The data show to even greater saventage in favor of the viewel for all four series of children than observed the series are computed individually. The reliability of the median difference does not show statistical significance in but the data reveal that there are about 16 chances in 100 that it is a tree difference.

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time scores in seconds for oblidees for all four serios. The range for the visual to 0.5 to 55 seconds and for the verbel is 0.5 to 500 seconds.

Table IX Shows a Comparison of Visual and Verbal Instruction Scores with all Four Series for Children

Series	1-2-3-4		1-2-3-4
Children	Visual Instruct	ion Verba	l Instruction
n	100		100
Range	0.535		0.5300
Mean	7.29		24 23
S.D.dis	6.17		40.60
S.E.	1.24		8.12
Diff. of means		16.94	
S.E.		4.35	
D.m Critical Ratio		3.9	
First Quartile	10		25
Median	4		11
Third Quartile	2.5		6
Q	3.75		9,5
S.E. mdn	1.55		10.15
Diff. of median	9	7.0	
S.E.		10.22	
D.mdn Critical Ratio		.69	

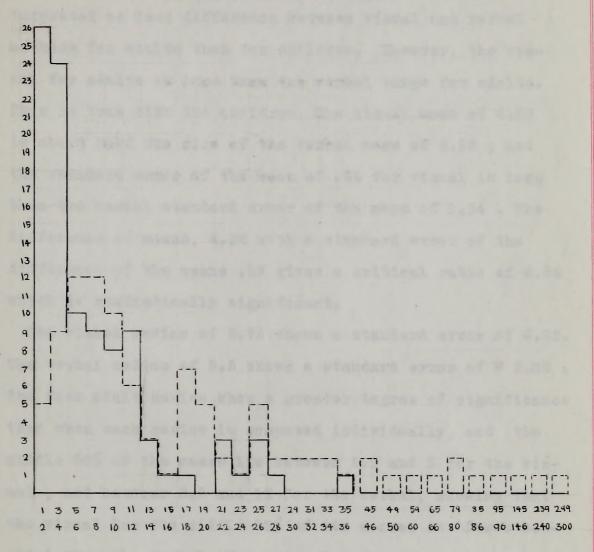
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08.08		6.27	s.D. 618
86.8		1.04	.8.8
	16.96		meser to .1110
	8.8		D.E. D.E. Zritkoal Retio
		0.0	slivacy tests
			calbet
		2.2	ofitted frid?
3.6		87.8	
10.35		53.5	.E.t
	0.7		netter to . Tito
	10.22		.E.C
	80.		alend Ratio

Figure 9

Distribution of Visual and Verbal Time Scores

of all four series for Children



Time Scores in Seconds

--- VISUAL FREQUENCY BOXES I &I

----VERBAL FREQUENCY BOXES I LI

THE RESERVE OF THE PARTY OF THE

instruction scores with all four series for Adults.

The range for the visual is 1 to 15 seconds and the range for the verbal is 1 to 48. Here the data is interpreted as less difference between visual and verbal methods for adults than for children. However, the visual for adults is less than the verbal range for adults.

This is true with the children. The visual mean of 4.50 is about half the size of the verbal mean of 8.82; and the standard error of the mean of .66 for visual is less than the verbal standard error of the mean of 1.64. The difference of means, 4.32 with a standard error of the difference of the means .89 gives a critical ratio of 4.84 which is statistically significant.

The visual median of 3.75 shows a standard error of \$\pm\$.83. The verbal median of 5.5 shows a standard error of \$\pm\$ 2.05. The four adult series show a greater degree of significance than when each series is computed individually, and the middle 50% of the cases lie between 2.5 and 5 for the visual, and between 3.5 and 12 for the verbal, showing that the visual has its middle 50% of its scores in 'fewer seconds' than the verbal. More visual scores occur in the 'fewer seconds' period, and only verbal scores occur in

the longer seconds area.

Figure 10 shows the distribution of combined time scores for visual and verbal for all four Adult series. The range of the visual scores is 1 to 15 seconds, and for the verbal is 1 to 48 seconds.

Table I shows a somperium of view of and variation for addiss the range for the viscal is 1 to 15 seconds on the fine range for the viscal is 1 to 46. Here the data is interpreted as less difference between visual and verbed respected as less difference between visual and verbed methods for adults than for obliders. However, the visual range for adults. This is less than the verbal range for adults. This is true with the obliders. The visual mean of 4.50 the short half the shield of the weeks of the weeks of the standard error of the mean of 3.66. The tian the verbal error of the mean of 1.66. The difference of means, 4.38 with a standard error of the mean of 1.66. The difference of the mean, 4.38 with a standard error of the seasons of the means as given a critical ratio of a.65 which is staticationally significants.

The visual median of 5.5 shows a standard error of 7.65.
The verbal median of 5.5 shows a standard error of 7.05.
The four shult series show a greater degree of significance than four shult series is demonstrated incivitabily, and the visual soft of the cases lie between 2.5 and 5 for the visual has its middle 505 of the middle 505 of the cases lie for the verbal, showing that the visual has its middle 505 of its meares in 'fewer seconds' parted, more visual scores occur in the verbal parted and verbal scores occur in the verbal parted, and only verbal scores occur in the cases seconds' parted, and only verbal scores occur in

Pigure IC shows the distribution of sendined time scores for vious and varial for all four Adult series. The danger of the visual scores is I to 16 seconds, and for the verbil is I to 48 seconds.

Table X Shows a Comparison of Visual and Verbal Instruction Scores with all Four Series for Adults

Series	1-2-3-4		1-2-3-4
Adults	Visual Instruction	Verbal	Instruction
n	100	100	
Range	115		148
Mean	4.50		8.82
S.D.dis	3.29		8.21
S.E.	•66		1.64
Diff. of means		4.32	
S.E.		.89	
D.m Critical Ratio		4.84	
First Quartile	5		12
Median	3.75		5.5
Third Quartile	2.5		3.5
Q	1.25		4.25
S.E. mdn	.83		2.05
Diff. of median	S	1.75	
S.E.		2.21	
D.mdn Critical Ratio		.79	

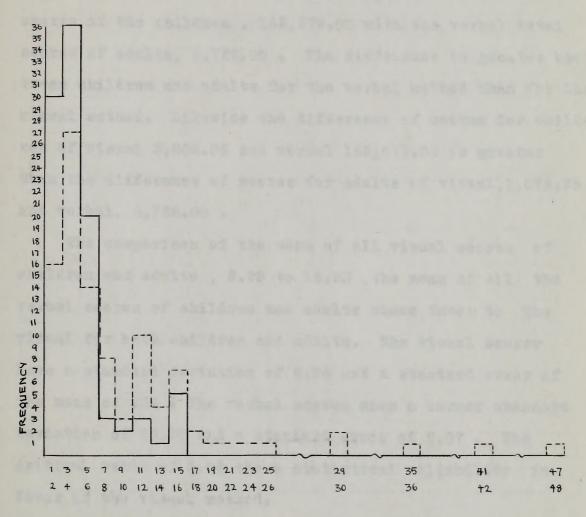
neites	0-1-0-1		1-1-1-1	
	Specifical Involv		instractio	
	31		88E	
	08.0		38.8	
815.4.8	8.20		12.8	
.21.8	20.4		1.64	
amose to .Thi		30.4		
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.2.8		13.0		
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Figure 10 shows the distribution of combined time scores for visual and verbal methods of instruction for all four adult series. The range of the visual scores is from 1 to 15 seconds, and the range for the verbal scores is from 1 to 48 seconds.

Figure 10 shows the distribution of combined time scores for visual and verbal methods of instruction for all four sault series. The range of the visual scores is from 1 to 15 seconds, and the range for the verbal scores is from 1 to 46 seconds.

Figure 10

Distribution of Visual and Verbal Time Scores of all four series for Adults



Time Scores in Seconds

----- VISUAL FREQUENCY BOXESTEI

--- -- VERBAL FREQUENCY BOXESTEIL

FIGURES

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40 47 21 02 3 21 41 27 4 8 8

Time Scores in Seconds

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Table XI shows a comparison of all visual scores for Children and Adults with all verbal scores for Children and Adults. The visual total scores for children is 3,802.06 seconds compared with 1,079.25 for adults. A greater difference exists in comparing the verbal total scores of the children, 165,579.00 with the verbal total scores of adults, 6,726.00. The difference is greater between children and adults for the verbal method than for the visual method. Likewise the difference of scores for children of visual 3,802.06 and verbal 165,579.00 is greater than the difference of scores for adults of visual,1,079.25 and verbal, 6.726.00.

The comparison of the mean of all visual scores of children and adults, 5.98 to 16.53, the mean of all the verbal scores of children and adults shows favor to the visual for both children and adults. The visual scores have a standard deviation of 4.94 and a standard error of the mean of .34. The verbal scores show a larger standard deviation of 29.35 and a standard error of 2.07. The critical ratio of 5.04 shows statistical reliability in favor of the visual method.

The median of $4 \pm .43$ for visual is less than the median 8 ± 2.59 for verbal. The differences of the medians show a critical ratio of 1.53 and while not entirely statistically significant, (by interpolation) there are 93 chances in 100 that this is a true difference.

Figure 11 shows the distribution of 200 visual time scores for Children (Series 1,2,3,4), and 200 verbal time scores for Adults (Series 1,2,3,4). The range of the visual is 0.5 to 35 seconds and for the verbal 0.5 to 300 seconds.

Callered and adults with all verbal scores for thildred consisted and adults with all verbal scores for thildred and adults.

A selfable of seconds occupated with 1,075.25 for adults. A season as some of the verbal cotes of season at the comparing the verbal total greater difference extern 105,570.00 with the verbal total total scores of the oblidies, 6,725.00. The difference is greater bear tween oblidies and adults for the verbal method than for the visual mothod. Likewise the difference of scores for children and visual 5,805.06 and verbal 185,570.00 is greater and varial. 5,755.00.

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Figure 11 above the distribution of 800 viscal time secret for Obilities (Series 1,5.5.4), and 800 verbal time secret for 18.5.4). The range of the visual to 0.5 to 35 seconds,

Table XI Shows a Comparison of

200 Visual Scores for Children and Adults
with

200 Verbal Scores for Children and Adults

	Visual		Verbal	
Children	3,802.06		165,579.00	
Adults			6,726.00 172,305.00	
Total				
Median	4.0		8.0	
Mean	5.98		16.53	
S.D. dis	4.94		29.35	
S.E.	.34		2.07	
S.E. mdn	. 43		2.59	
Diff. of r	neans	10.55		
S.E. D.m		2.10		
Critical I	Ratio	5.04		
Diff. of r	nedians	4.0		
S.E. D.mdn		2.62		
Critical F	Ratio	1.53		

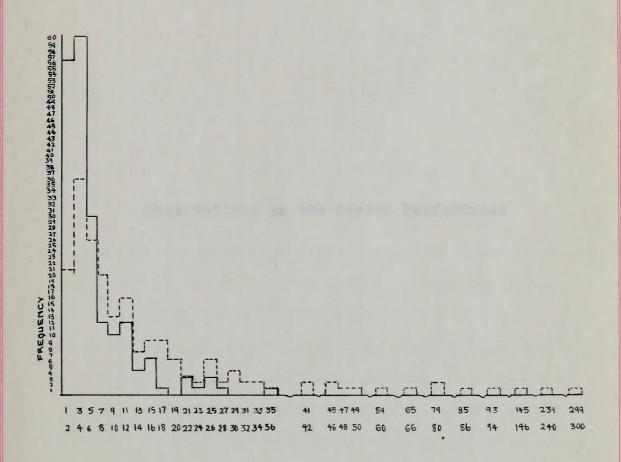
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88.88			4.94	610 .0.8	
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	0.5.2			.5.5	
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	0.0		enchon	20 .3910	
	20.3			3.E.	
	2.53		Serio	Legister	

Figure 11

Distribution of 200 Visual Scoresfor Children and Adults
and
200 Verbal Scores for Children and Adults



Time Scores in Seconds

---- VISUAL FREQUENCY BOXESTET

---VERBAL FREQUENCY BOXES I & I

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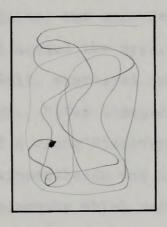
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The Scores in Seconds

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Observations on the Search Performance

Observations on the Search Performance



Eye Pattern

The nature of search varied with the individual. Eye patterns revealed that in most cases fixation at first was usually at that point in the Box nearest in view. While engaged in exploring the search field there was saccadic movement of the eyes.

With the visual method of instruction the subjects usually were more systematic in their search. This appears to be true for both children and adults.

With the verbal method of instruction wherein the mental picture had to be established by one's own interpretation, the eye patterns revealed less Observations on the Seatch Performance



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over totorpretation, the eye pattered revealed loss

systematic search. Age served as an advantage here, due to greater experience and knowledge.

Visual apprehension characterized the search performance for children and adults. The exploring and searching was accompanied by facial contortions (more in children than in adults) and muscular strain, particularly in the forehead and around the eyes. The average person, whether child or adult, expressed an interested intent upon rapid discovery. Utter disappointment characterized the face in case of a wrong discovery."

Nerbal kinaesthesis was demonstrated by pertinent and relevant comments which served to assist toward the goal. There were cases of repeating aloud the name of the object looked for. In the case of hunting for the button there were such remarks as "The Button", "The Button", with bodily movements accompanying the rhythm of speech. Or, pointing to an object and with a voice of interrogation saying, "That is it? " These gestures and remarks appeared to serve as an aid to discovery.

Touching objects in the field of search was not entirely but almost wholly confined to children. Some children were enticed by some object of their liking in design and color. They delayed their search in order to touch and inspect the object of their choice. There were requests to pursue further the search field after completing the task.

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Some children were anticed by some object of their liking in design and color. They delayed their search in
order to touch and inspect the object of their choice.

There were requests to parmis further the central field
after coupleting the task.

enlivened by feelings of doubt, eagerness, and glorious exultancy upon discovery. Bodily factors were prominently evidenced throughout the entire performance in shifting of the body, head movements, and frequently a finger systematically swept back and forth, up and down to assist in the location of the search object. Eye muscles were fundamental in the shifts of eye pattern. These characteristics were equally applicable to children and adults.

When the search object was indicated by verbal instruction, the children having less advantage than adults due to less experience, demonstrated pause, expectancy, some lack of assurance while the adults carried a feeling of confidence. This accounts for the greater difference in search time for children than for adults, between the visual and the verbal methods of instruction. While a difference in the degree of sustained set existed between children and adults, in both groups the mental and bodily set sustained the search until the goal was reached. Children were less systematic in their search than adults with both visual and verbal instruction. When the goal was reached tension released and relaxation ensued. A feeling of triumph :

In only a few cases did it appear that the element of chance occurred to cause the eyes to fall immediately upon the search object.

The process of exploration and alcourage was colivered by forties of doubt, begarness, and glorious colivered by forties of doubt, begins were prominent.

If evidenced throughout the entire performance is shifting of the body, beat movements, and frequently a finger operationally among back and forth, up and down to easist in the location of the search object. Myo mealed were fundamental in the shifts of sys pattern. These charges fundamental in the sparch object was indicated by versal teristics were aqually applies by a children and adults.

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Chapter V

Educational Implications

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Educational Implications

Educational Implications

while this study deals with the developed and functionally complete form of search called "goal search", it is worthy of note that all the functions, namely: perceiving, imagining, remembering, inspecting, comprehending, acting, emotional activity, and elaborative thinking, according to Bentley emerge from a primitive form of search. Perception is the first of these functions to appear. Its importance is expressed in the following statement by Locke. He says, "Perception is the first operation of all our intellectual faculties, and the inlet of all knowledge into our minds."

It has been said, "In the history of experimental psychology no topic has excited more research, and led to more discussion than that of how we perceive, or come to know the positions, relations, and meanings of things around us."

^{1.} Bentley, Madison, "The Psychologist's Uses of Neurology", The American Journal of Psychology, Vol. XLIX, (April, 1937), p.236.

^{2.} Locke, John, An Essay on the Human Understanding, Book II, Chapter IX, "Of Perception", p. 96.

^{3.} Garrett, Henry E. Great Experiments, p. 346.

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H. Looks, John, An Raray on the Juran Understanding, Dock II.

S. Sprratt, Soury E. Greek Experiments, p.346.

"Sense impressions lie on the basis of all mental activity and have an enormous practical importance in every day life."

The higher senses of "hearing" and "seeing" are of concern in this study. It has been the concern of this experiment to investigate these higher senses of "hearing" and "seeing" to detect which might be used to a greater advantage in certain educational procedures.

The first step in economical learning is to establish the goal. If we believe in the principle that responses are selected and organized in terms of their relevance to the learner's goal, then this study has certain definite implications for educational methods. Let us define development of skill, as a series of successive approximations to a successfully completed performance. It is imperative that learners have a clear picture of the successful performance, or a definite knowledge of the appropriate criteria in advance. The right kind of instruction needed for such successful performance. Just as great care should be taken in selecting tasks for the learner master, so should we select the type of instruction suitable not only to the situation, but also to the learner. If the child performs his task better, more quickly, and more efficiently by being told what to do, then verbal instruction

^{1.} Garrett, Henry E. Great Experiments, p.346.

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^{1.} Garrett, Heary R. Great Languineate, v. 346.

is better for him. If, on the other hand, he performs his task better when shown what to do, then visual instruction should be used for him. In other words, we are attempting to find the best means to an end. While authorities in psychology admit a close relationship between intelligence and problem-solving ability, it should not be assumed that the higher mental processes develop instinctively to the optimum level of functioning. It is said that "training in systematic methods of problem solving is necessary for the attainment of maximum efficiency." Our job now is to give the direction that provides the best aid in problem solving. Our daily life is full of problem solving.

Search is constantly and ever present in problem solving. What is done about search? We can cultivate search by providing the most effective instructions. Shall the instructions be verbal or visual? We instruct through perception. Shall it be verbal or visual perception? We inculcate by example. Shall it be by means of ear or through the eyes?

By carefully controlled experimental procedures this study discovered that visual instruction had significant advantage over verbal instruction for children and adults in the type of performance used; but it further showed that

Gates, Arthur I., Jersild, Arthur T., McConnell, T.R., Challman, Robert C., Educational Psychology, p. 332.

^{2.} Ibid. pp.495-496.

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^{2.} Ibid. pp. 495-496.

the child profits by visual instruction relatively more than the adult. Should this not have significance in educational methods for children? This evidence of superiority of visual instruction over verbal has already been incorporated into our educational methods in the form of visual aids.

We ask "How much learning employs search?" Do we not search for the purpose of clarifying a concept? Upon rising in the morning the proper garment is searched for. At school, the child searches for his books and pencils. In the library he searches for the proper book. Then he searches the text for answers to his problems. Through the years he makes an observational search of his interests and talents in order to arrive in the profession or vocation of his choice or adaptability. All through life's work we search for truth. As apparently a large part of learning employs search, is it not desirable to learn in the most economical way?

While this study has demonstrated that visual instruction is the more effective way to set a person for an efficient search performance, it is not the purpose of this study to evaluate visual instruction in education. However, it is interesting to note that the educational demonstrations of the value of visual instruction through visual aids is wholly in accord with the findings of this study.

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An experimental study by Krasker showed that "the educational motion picture proved to be an effective device for increasing factual learning."

^{1.} Krasker, Abraham "A Critical Analysis of the Use of Educational Motion Pictures by Two methods." Unpublished Doctor's Dissertation, Boston University, 1940. p.7

^{2.} Ibid. p.176.

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^{2.} Ibid. p.176.

Chapter VI

Summary

Conclusions

Suggestions for Further Research

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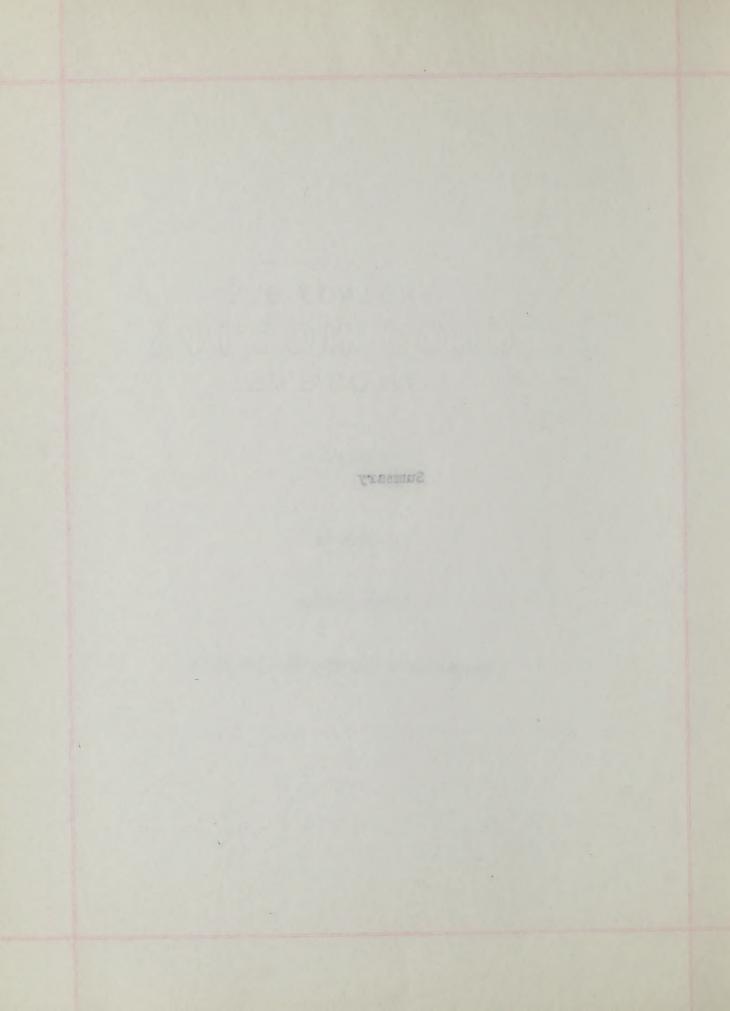
· Conclusions

Suggestions for Forther Research

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Summary Summary

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Summary

With a group of one hundred Third Grade Children of the Belmont Public Schools of Belmont, Massachusetts, and a group of one hundred adults of various vocations, this experimental study endeavored to discover "age" and "instruction" differences in the psychological function of search. The experiment was designed to have each subject explore 'to discover' a designated object in a search field. Each subject was given an opportunity to hunt for a designated object in one search field after being shown the object he was to find. Likewise, he was given an opportunity to hunt for a designated object in another search field by being told what he was to find. Thus, two methods of instruction, "visual" and "verbal" were employed, and a comparison of the search times was made between the two methods. Also, the two age groups (children and adults) were compared as to their search times.

The visual and the verbal methods of instruction sufficed their purpose in preparing a proper mental set and sustained concentrated attention toward the goal of the search. Data reveal, however, that the visual and the verbal methods demonstrated definite contrast rather

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than similarity in degrees of success. The visual method of designating the search-object gives to the individual a feeling of confidence, pleasure, and ease towards success, and a rapid recognition of the object. There is no conflict between the visual image and the perception. The discovery is quick.

The verbal method of instruction calls for an imaginal creation of the object named. A mental concept needs to be established as to size, shape, color, and then it frequently does not match the object sought. That must be discarded and another concept called forth. This conflict throws out the feeling of pleasure, confidence, and ease. The discovery is less rapid.

The statistical data of the study show that the visual method of instruction required less search time for both children and adults:

- l. For children, a comparison of search times required by the visual method of instruction with the search times required by the verbal method of instruction shows a visual mean of 7.29 seconds # a standard error of 1.24 seconds and a verbal mean of 24.23 *asstandard error of 8.12 seconds.

 The medians were for the visual instruction, 4 seconds # a standard error of 1.55 seconds, and for the verbal, 11 seconds # a standard error of 10.15 seconds.
- 2. For adults, a comparison of search times required by the visual method of instruction with the search times required by the verbal method of instruction shows a visual mean of 4.50 seconds = a standard error of .66 seconds, and

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a verbal mean of 8.82 seconds ± a standard error of 1.64 seconds. Likewise, the median runs lower for the visual, which is 3.75 seconds ± a standard error of .83 seconds as compared with the verbal median of 5.5 seconds ± a standard error of 2.05 seconds.

In comparing children with adults for the visual method of instruction, the mean for the children is 7.29 seconds. The mean for the adults is only 4.50 seconds. A comparison of children with adults for the verbal method of instruction, shows that the verbal mean of 8.82 for adults is smaller than the verbal mean of 24.23 for children. The data reveal that a greater difference in search times exists for children between visual and verbal methods of instruction than exists between the two methods for adults.

When comparing all visual scores for both children and adults with all verbal scores for both children and adults, the data show that the visual mean is 5.98 as compared with the verbal mean of 16.53, and likewise, the visual median is 4 as compared with the verbal median of 8. Of the two methods of instruction, "visual" and "verbal", the visual method of instruction is superior to the verbal method of instruction as judged by the time required to complete successfully the search.

coupaired with the verbal and is a seasond a second of 1.60 and to verbal . Second a second a 3.15 accords a standard arror of .85 seconds and compared with the verbal modian of 5.5 seconds a standard of 2.05 seconds.

In comparing obligator with adults for the vigual arthod of testination, the mean for the sublicants is 7.89 seconds. It is mean for the sublicant is 7.89 seconds. It is mean for the seconds is confident with adults for the verbal method of institution, of onliders that the verbal mean of 8.80 for adults is smaller time the verbal mean of 84.60 for adults. The data reveal that a greater difference is secret times and the two methods of instituted and verbal methods of institution that the theory adults and the two methods of institution that a state order adults.

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Conclusions

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- 5. When comparing children and adults, the greater difference in search times between the visual and the varial methods of instruction was found among children.
- of instruction for variability in search times revealed the greater variability in the verbal method. A comparison of variabilities of search times between children and adults revealed greater variability for children.

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The results of this experimental study suggest the following conclusions:

- 1. For children, a comparison of search times required by the visual method of instruction with the search times required by the verbal method of instruction showed that the visual method proved to be more advantageous in that it required appreciably less time than the verbal.
- 2. For adults, a comparison of search times required by the visual method of instruction with the search times required by the verbal method of instruction showed that the visual method proved to be more advantageous in that it required appreciably less time than the verbal.
- 3. When comparing children and adults, the greater difference in search times between the visual and the verbal methods of instruction was found among children.
- 4. A comparison of the visual and the verbal methods of instruction for variability in search times revealed the greater variability in the verbal method. A comparison of variabilities of search times between children and adults revealed greater variability for children.

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- 3. When comparing children and adults, the greater difference in search times between the visual and the verbal methods of instruction was found among children.
- 4. A comparison of the visual and the verbal methods of instruction for variability in search times revealed the greater variability in the verbal method. A comparison of variabilities of search times between children and adults revealed greater variability for children.

- 5. Adults showed a superior advantage over children in the ability to form and to maintain an adequate set for search and discovery.
- 6. There was detectable difference between children and adults with respect to the manner in which the searching process is carried out. Touching of objects and verbal kinaesthesis were more pronounced in children than in adults. Bodily and mental poses were less in evidence among adults than among children. Adults were more systematic in search than were children.
- 7. The data from this experimental study reveal that the visual method of instruction proved superior to the verbal method of instruction for both children and adults .

- norblide tovo egatestar to respect to maintain an adequate not for search and discovery.
- o. There was detectable difference between children and adults with respect to the manner in which the search and ing process is carried out. Tonching of objects and verbal kineesthesis were more pronounced in children than in adults. Hodily and mental posse were less in evidence among adults than among children. Adults were more approximatio in search than were children.
 - 7. The date from this experimental study reveal that the visual method of instruction proved superior to the verbal method of instruction for both children and adults.

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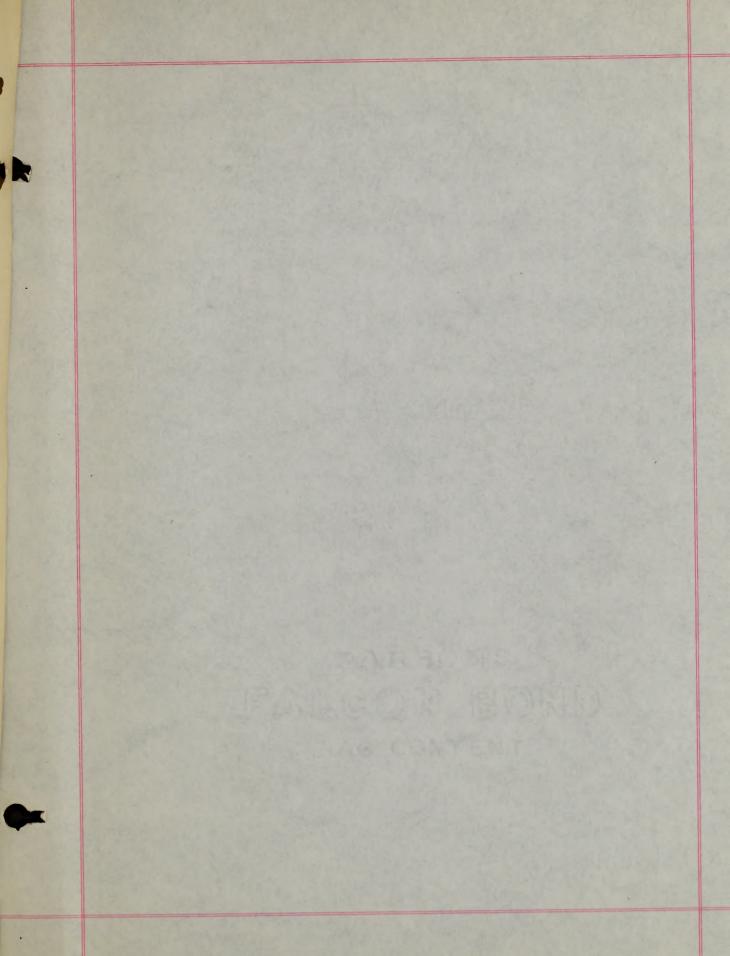
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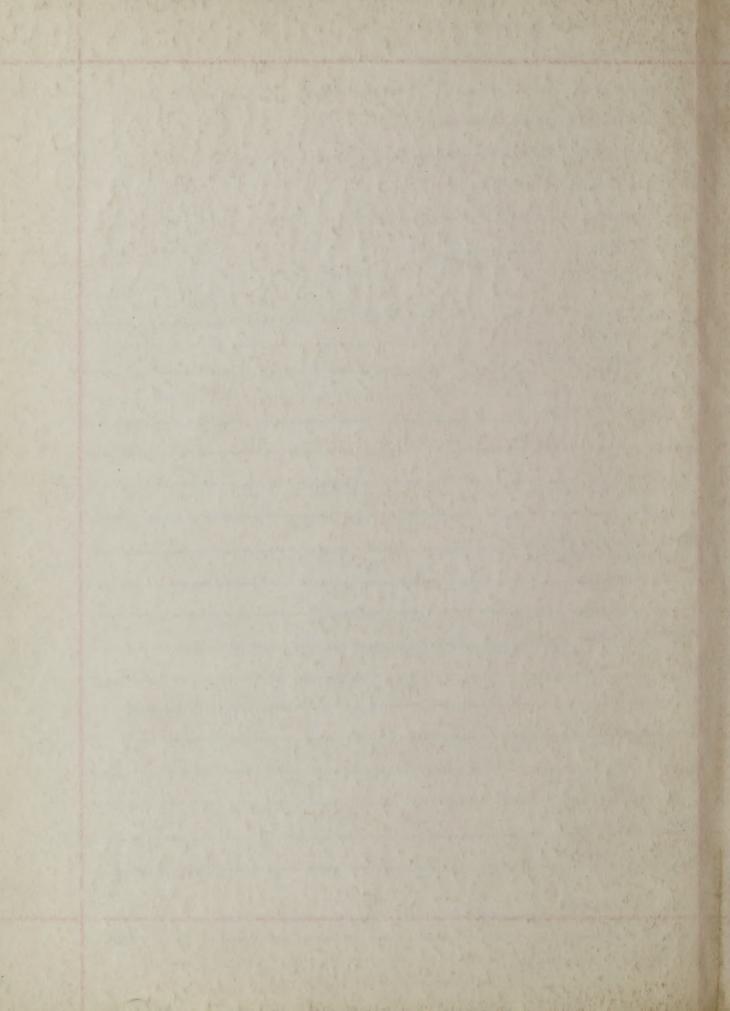
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Date of Test)	S
Name of Child		18	
Age years months	6	(A)	
Birthday		1 70/16	
Sex Race	1/1/	18/11	1
Grade	1/6/	1	
I. Q. M. A.		168	8
Time for Test	Box I	Box	
Method of Attack	Uisual Instruction	Verba	1,
approach (systematic or lack of system)			
facial expression		-	
posture			
bodily movements			
		-	
DispositionAtt1tude			
Child's remarks			
concept of search object (for auditory)			
Miscellaneous			
Urging or prompting			
Individual Record She	et		

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